

Results of Unintentional Injuries among Preschool Children Enrolled in Day-care Centers from Selected Villages around Gaborone, Botswana

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Abstract

This study employed a descriptive cross-sectional study qualitative and quantitative designs to gather data through structured interviews, questionnaires over a certain period in time in the past (retrospective) and the present (concurrent), and then analyze the results. The study was undertaken in the selected villages around Gaborone Botswana, situated in the south of the country. Its final focus was to publish the research results from a research survey done on unintentional injuries among preschool children enrolled in day-care centers from selected villages around Gaborone, Botswana. The population consisted of 47-day care centers in the selected villages around Gaborone which are all situated in Mogoditshane/Thamaga Subdistrict. A sample of 45 care centers was drawn using Yamane formula. Data were then collected through auditing, structured interviews, and questionnaires. The Statistical Package for Social Sciences (SPSS) program was used to analyze the data. The summary of the results of the current study show that: i) Males are more likely to get injured than females ii) Older children are more likely to sustain UI (iii) UI are sustained in the late afternoons iv) UI are more likely to be sustained in the early and late part of the week v) Season or term of study is not a factor of UI vi) Amount of time spent at school is a factor of UI (Davis, Godfrey & Rankin 2013). The findings indicate that there are factors that can have a negative influence on the occurrence of unintentional injuries in day care centers. It is suggested that a supportive teaching programme in the form of a workshop for service providers, teachers and parents should be designed, that will support the system of unintentional injury prevention program for preschool children in day care centers in order to prevent unintentional injuries in the selected villages around Gaborone, Botswana.

Keywords: *Contributing factors to unintentional injuries, Day care centers / pre-schools/ preprimary units, Interventions on unintentional injury prevention, Unintentional injuries, Unintentional injuries prevention, the Prevalence of unintentional injuries in childcare settings.*

Introduction

Daycare centers and pre-schools provide custodial, educational, or developmental services to pre-school age children to prepare them to enter elementary school grades. This includes nursery schools, kindergartens, head start programs, and any similar facility

primarily engaged in the care and protection of pre-school age children [1].

In such settings, children are more prone to unintentional injuries because children's participation in such childcare settings involves constant physical activity, open-air play, and relaxation as they play around at centers. Again, this is because of their rapid physical growth,

strength, motor skills, and greater independence as children during their pre-school year, which greatly increase their vulnerability and dependence on other people in relation to safety against unintentional injuries [2].

Most occur at schools and daycare centers [3]. When children are under care in a childcare setting, a child is likely not the only child there, it can be difficult for childcare providers to always pay attention to every child, which can lead to unintentional injuries. Most studies reported childcare injuries are caused by falls or during use of outdoor playgrounds or climbing structures [4].

Unintentional injuries in childcare settings are so devastating because of the impairment that the injuries can cause to a child and the lasting impact on all aspects of the child's life [5].

Botswana is divided into various districts which are administered by local authorities (district councils). So as the case stands children's centers/childcare settings are established in the various districts of Botswana to provide a range of services, including early education, social care and health to pre-school children and their families. Kweneng district is one of the districts of Botswana which is of interest to the current research. The district was pinpointed because it is highly heterogeneous and characterized by a social mix of people from different parts of the country and other countries. It is unique in the sense that it has both urban and rural settings because of the influence it is getting from Gaborone the capital city of Botswana. That is why it has the edge over other districts, and it is seen as having a positive effect on business in the district as it attracts a lot of investors who choose to locate in the area, in particular for retail, light industrial, and other activities such as daycare centers against a very strong competition from Gaborone.

Unintentional injuries are those injuries that are not inflicted purposely, occur without intent of harm" [6, 7].

There has been little work in the district exploring childcare settings experiences of unintentional injuries in childcare settings. If unintentional injuries cannot be addressed, the cases are likely to escalate and as a result, unnecessary lives will be lost to causes those are largely preventable.

A study cited that the rate of unintentional injuries for children in sub-Saharan Africa has reached 53.1 per 100,000, the highest for regions across all income levels. Despite the high burden, child injury prevention and control programs and policies are limited or non-existent in many countries in the region. Accurate data regarding these injuries across and within countries is incomplete. Population-based estimates and investigations into context-specific risk factors, safety attitudes, and behaviours are needed to inform the development of effective interventions [8]. This kind of information would serve as the basis for the child's unintentional injury prevention control measures.

The study conducted a systematic review of the literature to assess the evidence of unintentional injuries available, describe the pattern of unintentional injuries, examine environmental, and child factors contributing to injuries and injury severity, and finally explore the activities being undertaken in day care centers among pre-school aged children of the selected Villages around Gaborone, Botswana.

Methods

Study Design

This study is a descriptive cross-sectional study design. For this type of study, the study design is used to gather data through interviews, questionnaires, and focus groups over a certain period which may be in the past or the present, and then analyze the results. The study design is also used to assess the prevalence of unintentional injuries in childcare settings at a specific period. We can measure factors influencing unintentional injuries and use data obtained for designing unintentional

prevention programs. Concurrent and retrospective designs were also used to conduct a systematic review of the literature to assess the evidence of unintentional injuries available in the district daycare centers. A descriptive purposive sampling technique was the main technique used to select the 52-day care centers out of the 61 in the foresaid district of Botswana. Both quantitative (Structured) and qualitative (unstructured) approaches for data collection were utilized.

The study population consists of the 47 licensed daycare centers of the selected Villages around Gaborone, Botswana are the study day care centers identified.

Inclusion Criteria

The Day care centers were Botswana Qualification Authority accredited (BQA), public, private, and licensed, such as daycare centres, pre-schools, playschools, kindergartens, reception schools, crèches and nurseries, etc.

Exclusion Criteria

Day Care Centers offering childcare and babysitting services without the approval of the selected Villages around Gaborone, Botswana.

Sample Size

Sample Size Determination

The sample of the day care centers was calculated using Yamane formula with 95% confidence level [9]. The formula provided a simplified formula to calculate sample size.

$$n = \frac{N}{1 + N(e)^2}$$

Where n = sample size, N = population size and e = Margin of error (0.05).

$$n = \frac{47}{1 + 47(0.05)^2} = 45$$

Other participants of the study were policy Makers who included the social and Community Development Office (S&CD) in Mogoditshane/Thamaga Sub District, the

Ministry of Local government, and Rural Development (1). Key informants, consisting of service providers- 1 per each childcare center 1(45) who were SHE- 1 per each childcare center 1(45), teachers- 1 per each childcare center 1(45), selected day care centers heads -1 per each childcare center 1(45). Stakeholders included regulatory authorities within the Ministry of Local government and Rural Development (1).

Variables Needed

Independent variables were factors contributing to unintentional injuries that were investigated in Day care centers of the selected Villages around Gaborone, Botswana.

Dependent variables are Day care centers in the selected Villages around Gaborone, Botswana. 47 licensed day care centers in the selected Villages around Gaborone, Botswana were the study day care centers identified. A sample of the Day care centers (45) were randomly chosen from the list of 47-day care centers.

Data collection used the self-developed five (5) survey instruments as follows:

The five-survey instrument self-developed tools were used to collect data as follows:

1. Tool 1: Audit of case records on unintentional injuries in a daycare centre.
2. Tool 2: Interview schedule for service providers in a daycare centre.
3. Tool 3: Interview schedule for head of daycare centre.
4. Tool 4: Checklist on compliance with safety standards and guidelines for licensed daycare centres.
5. Tool 5: Interview schedule with social services on monitoring compliance and enforcement offences and good regulatory practices by child day care centers. Data collection was collected through conducting interviews, administering questionnaires, rating according to checklist, and conducting inventory audit.

The analysis of the study looked into the demographics and outcome variables summarized using descriptive summary measures expressed as mean (standard deviation) for continuous variables and percentages for categorical variables such as age. Chi-square test shall be used to determine the test of association between the categorical variables. The $p < 0.005$ was set to be significant.

Descriptive statistics were used to summarize important features of numerical data. Mean and median child injury rates were calculated by sex, age, and a childcare center. Age categories were created for ages less than 3.5 than ages more than 3.5 years for distributions in each category. The characteristics of reported unintentional injuries (e.g., type of injury and severity) to children ages less than 3.5 than ages more than 3.5 years in the childcare setting were analyzed using descriptive statistics, including frequency and proportions were used to examine type of injury, body part injured, location of injury occurrence, and severity of the injury. Frequency distributions and measures of dispersion were calculated for each of the variables. The characteristics of childcare providers experienced, and age of children in unintentionally injured in the ecological context of day care centers that may be related to the child's development and the occurrence of unintentional injuries in children ages less than 3.5 than ages more than 3.5 years old in day care centers. Childcare providers participating in the study were asked a series of questions related to their experienced backgrounds,

knowledge of the child and work environment. For the subset of children ages less than 3.5 than ages more than 3.5 years of age who had a reported unintentional injury while at a day care centers, the answers to these questions were evaluated for descriptive statistics, including frequency and proportions, to determine components of the ecological environment of the day care center that relate to the child's development and unintentional injury occurrence. Frequency distributions for the time, month, type of injury, body part injured, location, activity, contributing factors, and severity of the injuries shall calculate, and the χ^2 test will analyze the relations between contributing factors and injury severity. Statistical significance was set at $P < .05$. Data was analyzed by the appointed Statistician using appropriate and available Statistical Software. The results were discussed in the sequence of the specific objectives and in terms of the conclusions drawn from the research questions associated with each specific objectives and the hypothesis testing of the study. Possible implications of significant findings were explored in terms of study limitations. Descriptive data results from the study were aligned with the previous studies that described the occurrence of unintentional injuries to children in day care centers.

Results

The selected villages around Gaborone are Mogoditshane, Thamaga, Mmopane, Metsimotlhabe, Gabane and Kumakwane were the selected villages as areas of study as shown in Table 1 & 2.

Table 1. The Identified 47-Day care Centers by Mogoditshane/Thamaga Subdistrict Community Development Office (S&CD)

Mogoditshane	Thamaga	Mmopane	Metsimotlhabe	Gabane	Kumakwane
28	7	5	3	4	1

Table 2. The Selected Villages around Gaborone and the Number of their Day Care Centers

Mogoditshane	Thamaga	Mmopane	Metsimotlhabe	Gabane	Kumakwane
28	7	5	3	4	1
N(47)					

Of the 47-day care centers 45 were sampled for the study. The prevalence of UI among boys and girls, age, time of injury, day of injury, season of injury and attendance type were determined and analyzed to check if the difference was statistically significant or merely coincidence. A total of 3002 children were identified from the 45 daycare centers. Of which 1060 (35%) were half time and 1942 (65%) were full time 1534 (51%) were girls and 1468 (49%) were boys.

1662 (55%) were age-less than 3.5 years old whilst 1340 (45%) were age greater or equal 3.5

years. A total of 1274 (42%) sustained UI injury of which 382 (30%) were girls and 892 (70%) were boys. Of the 1274 who sustained UI injury 573 (45%) were of age less than 3.5 years old whilst 701 (55%) were of age greater than or equal 3.5 years.

420 (33%), 424 (33%), and 430 (34%) injuries occurred in the First, Second and Third term respectively.

Of the 1942 full time, 860 (44%) sustained injury, whilst of the 1060 half time, 414 (39%) sustained injury.

Table 3. Observed Injuries by Amount of Time Spent (Full/half)

Injured (%)	Not Injured	X2-test (Pearson's, d.f,		
Numbers	1274(42)	1728(58)	-	
Attendance Type	Full	860(44)	1082(56)	7.4587; 1

Children who spend more time in day care center are more likely to sustain UI injury (p-value 0.006). Numerous studies (Kelley 2013,

Lee & Bass, 1990) have shown that children who spend more time in day care centre are highly likely to sustain UI.

Table 4. Types of Minor Injuries Prevalent in the Centers

Type of Injury	Scratches	Bruises	hurt ankle	Other (falls, fractures, pushing others, Sprains, cut on forehead, etc.	P-value)
Observed Injuries	51 (4%)	52 (4%)	13 (1%)	1158 (91%)	0.001

The results of the current study showed the findings by the type of injury such as scratches, bruises, hurt ankle, Other (falls, fractures, pushing others, sprains, cut on forehead and many more). Studies by Jacquess & Finney, 1994) identified the specific types of injuries

which included closed head injury, hurt ankle, broken toes, stitches in knee, infected cut, cuts from bicycle wreck, puncture wound in foot, sprained foot, chipped elbow, cut on head, cut wrist, bruises, and abrasions.

Table 5. Observed Injuries by Body Part

Body part	Legs	Face/Head	Hand	P-value
Observed Injuries	420 (36%)	288 (25%)	450 (39%)	< 0.0001

The results of the study showed the type of injury, body part injured location of injury occurrence, and severity of the injury such injuries were more likely to happen on legs or hands than on the faces.

Hypothesis Testing

Once the null hypotheses were tested and the results of the study would show whether:

Table 6. Hypothesis (*H01*) Test, No. of Children Injured by Age Groups

Injured (%)	Not Injured	X2 -test (Pearson's, d.f, P-Value)	
Numbers	1274(42)	1728(58)	-
Age group	Age <3.5	573(45)	1089(63)
	Age ≥3.5	701(55)	639(37)

Analyses of variance were used to analyze and compare children aged less than 3.5 than children aged more than 3.5 years.

The hypothesis of the Research Study show that there is significant difference between injuries rates for unintentional injuries among younger preschool children aged less than 3.5 than children aged more than 3.5 in day care centers. Older children were more likely to get injured than younger children (p-value <0.0001). The null hypothesis that older children were more likely to get injured than younger children is rejected.

The research results conclude that there is general agreement on the fact that a child's age is a significant factor in the occurrence of unintentional injuries. Alkon, Ragland, Tschann, Genervro, Kaiser, Boyce (2000) also found that age was significantly associated with injury. Furthermore, Dal Santo (1995), also provided evidence that occurrence of injury is affected by age.

We conclude that older children were more likely to get injured than younger children.

Table 7. Hypothesis (*H02*) Test: No. of Children Injured by Gender

Injured (%)		Not Injured	X2 -test (Pearson's, d.f, P-value)	
Numbers		1274(42%)	1728(58%)	-
Gender	Girls	382(30%)	1152(67%)	393.43; 1; <0.0001
	Boys	892(70%)	576(33%)	

The T-test (aka Student's T-test) was used for comparing two data groups' boys and girls which had different mean values. The T-test allowed us to interpret whether differences are statistically significant or merely coincidental. The results of the T-test were expressed in terms of probability (p-value). If the p-value is below a certain threshold, usually 0.05, one can be very confident that the two groups, boys and girls really are different, and it wasn't just a chance variation between the sample data.

The test provided sufficient evidence to support the claim being made. Boys are more likely to sustain injury more than girls (p-value<0.0001). The null hypothesis of no association between day and the occurrence of unintentional injuries is rejected.

Alkon-Leonard (1999) also found that boys had the highest injury rates compared to boys in equivalent centers.

Table 8. Hypothesis (*H03*) test: Observed Injuries by Time Factor (Hourly, Daily & Seasonal Peaks)

Time of Injury	10 AM	11 AM	12 NOON	1 PM	2 PM	3 PM	P-value
Observed Injuries	190 (15%)	195 (15%)	207 (16%)	212 (17%)	224 (18%)	246 (19%)	0.03686

Using the T-test, ANOVA analysis shows a significant association between time and the occurrence of unintentional injuries. Injuries are more likely to occur late in the afternoon than in the morning (p-value=0.03686). The null

hypothesis of no association between time of injury and the occurrence of unintentional injuries is rejected.

We conclude that there is a significant association between time and the occurrence of

UI. Day care centers which proceed to late afternoon are highly likely to experience UI.

Table 9. Observed Injuries by Day of the Week

Injury	Mon	Tue	Wed	Thu	Fri	P-value
Observed Injuries	272 (21%)	233 (18%)	24 (19%)	245 (20%)	284 (22%)	0.04951

(P-value=0.04951)

The null hypothesis of no association between day and the occurrence of unintentional injuries is rejected. There is a significant association between day and the

occurrence of unintentional injuries. Injuries are more likely to occur at the early and later part of the week (p-value=0.04951).

Table 10. Observed Injuries by Season (Term 1, 2, 3)

Season of Injury	Term 1	Term 2	Term 3	P-value
Observed Injuries	420 (33%)	424 (33%)	430 (34%)	0.9144

There was no significant association between season and the occurrence of unintentional injuries (p-value=0.9144).

The hypothesis of the Research study showed that there is a significant association between time factor (peak hour for injury, peak day for injury, and the occurrence of unintentional injuries in day care centers of the selected villages around Gaborone. Botswana. However, peak season for injury was not a

factor. In one such study identified was by Alkon et.al (1999) conducted a study on the epidemiology of injuries in 4 childcare centers and investigated injuries by hourly, daily and seasonal peaks. The null hypothesis is rejected. We conclude that there is a significant association between occurrence of injuries and time. The results showed that injuries most occurred before lunch in each center. There was no peak by month (season) or day of the week.

Table 11. Summary of Child Care Providers' Responses Related to Work Experience to the Current Job

Experience Status	Total	(%) Mean Proportion	Injured Standard Deviation	P-value (0.004)
Yes	25	(55.6%)	0.0608	0.03133
No	20	(44.4%)	0.0928	0.03914

Since the p-value is 0.004, the null hypothesis of no association between experience of teachers and the occurrence of UI is rejected. We conclude that there is a

significant association between the experience of teachers and the occurrence of UI. Day care centers with experienced service providers are less likely to experience UI.

Table 12. Summary of Rated Response by Regulatory Authorities to Monitor Compliance and Enforcement Offences

Compliance Status	Total	(%) Mean Proportion	Injured Standard Deviation	P-value (0.005)
Yes	23	(51.1%)	0.0599	0.03147
No	22	(48.9%)	0.0908	0.03870

The intention was to obtain a good picture of how the day care centers operate and how the regulatory authorities within Ministry of Local

government and Rural Development ensured compliance of the day care centers.

The t-test was used to test if there is significant difference between the proportion of

injuries between those day care centers which complied and those which did not comply.

The results of the current study show how the regulatory authorities within the Ministry of Local government and Rural Development monitor compliance and enforcement offences and also identify good regulatory practices by the child day care centers. Since the p-value is less than 0.05. The null hypothesis of no association between compliance and the occurrence of UI is rejected. We conclude that there is a significant association between compliance and the occurrence of UI. Day care centers which do not comply are highly likely to experience UI. In one study analyses of child care licensing inspection reports provide valuable data and findings for strategic planning efforts. This would enable one to maintain the standard recommended by the ECCE policy document and raise the quality of ECCE programmes in Botswana.

A study Health and safety of childcare centers: An analysis of licensing specialists, reports of routine, unannounced inspections by Crowley monitored compliance with state child regulations.

The results of the study indicate that the Day care centers should continuously monitor for conditions that may lead to children being injured and examine both the behaviors of children and care providers in the environment. This would include regular screening for safety and analysis of data surrounding unintentional injuries. In such childcare settings would be a need for service providers to be equipped with skills and resources required for their day-to-day work with children.

The results of the current study show that:

1. Males are more likely to get injured than females.
2. Older children are more likely to sustain UI.
3. UI are sustained in the late afternoons.
4. UI are more likely to be sustained in the early and late part of the week.

5. Season or term of study is not a factor of UI.

6. The amount of time spent at school is a factor of UI (Davis, Godfrey & Rankin 2013).

Discussion and Conclusion disparity

The study showed that there are differences between the characteristics of unintentional injuries and the factors contributing to such. Several studies have alluded to the findings in this study. Some of the following studies focused on describing the occurrence of injury. Some used descriptive designs to look at the types, prevalence, and risks of injuries in childcare centers.

Conclusion

This study led to the conclusion that unintentional injuries that occur to children in day care centers have a significant role to play in policy and injury prevention development. Factors would include context-specific risk, safety attitudes, and behaviors factors are needed to inform the development of effective interventions.

Furthermore, these are all significant factors that need to be further explored in future studies.

The current study has a chance to be limited to a few cause-and-effect relationship between independent and dependent variables such as falls from playground equipment which result in unintentional injuries in childcare centers on falls while in actual fact there are numerous factors occurring and interacting that may result in unintentional injuries for example: Individual behaviors, such as falls and collisions with objects or the behavior of another child, such as pushing or hitting.

Environmental factors that contributed to the injury occurrence, such as a wet or slippery floor, faulty equipment or furniture, a sharp object, or a window or door, premises health record such as buildings status, emergency preparedness, rules on eating and drinking,

personal hygiene, and food safety/food handling.

Other factors at the childcare center would include center's policies on supervision and playground equipment, the child's physical growth and cognitive understanding and age and many other aspects that can be scrutinized to result in unintentional injuries.

Recommendations

1. Because most injuries occur during free play, on the playground, and before meals, improved child supervision may help prevent injuries in preschool-aged children.
2. Establish priorities from different unintentional injuries factors identified in childcare of the selected villages around Gaborone, Botswana.
3. Stimulate further research, to indicate the deficiencies in the model being used. It could lead to the model being redesigned, in order to make it more user friendly in Botswana.
4. Plan workshop programs leading to improved quality in reduction of unintentional injuries in childcare settings by improving the competencies of workers and ultimately the quality of promotion of prevention of unintentional injuries management in childcare settings.
5. Reinforce monitoring and evaluation to identify best practices for prevention of unintentional injuries in childcare settings.
6. Other potentially useful interventions to reduce child factors that contribute to injuries may be to reduce the number of

children on the playground at one time and provide more structured small-group activities.

7. In-service workshops for teachers and service providers would heighten their awareness of the consequences of unintentional injuries, emphasize the importance of identifying children who sustain frequent minor injuries, and inform teachers of what they can do to decrease injuries at their center.

Future Research

How much has the unintentional injuries strategies that have been put in place day care centers of the selected villages around Gaborone, Botswana achieved the aim and objectives of decreasing unintentional injury rates to their lowest conceivable levels?

There is a need for research pertaining to unintentional injuries in childcare centers that precisely looks at or accepts the relationships among numerous factors occurring and interacting that may result in unintentional injuries, cognitive, the developmental, environmental factors, and the larger environmental/ecological context surrounding these factors.

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Conflicts of Interest

The author declares no conflicts of interest.

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