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Child and Adolescent Victims in Forensic Autopsy: A 5-Year Retrospective Study*

ABSTRACT: Children of more than 3 years of age and adolescents have been largely overlooked in the forensic literature, especially the 4–9 age group. Thus, the present study was undertaken to address this particular issue of child and adolescent victims in forensic autopsies. On a 5-year period (2000–2004) in Quebec province (Canada), all forensic autopsy cases of children and adolescents from 4 to 19 years of age were retrospectively studied. A total of 223 cases of child and adolescent deaths (148 males, 75 females; 6.6% of all forensic autopsies) were reviewed. Age, gender, manner of death and cause of death were analyzed for all victims organized into three groups of age: 4–9, 10–14, and 15–19. Moreover, homicide cases ($n = 54$) are further analyzed in terms of method(s) used (firearm, sharp force, asphyxia, blunt force, intoxication). This 5-year retrospective study may contribute to a better understanding of typical deaths in the 4–19 group of age and therefore, bring a working basis for the forensic pathologist or medical examiner/coroner.

KEYWORDS: forensic science, pathology, child death investigation, adolescent death investigation

Recently invited to give a lecture on forensic autopsies of children older than 3 years of age, the authors realized that this group has been largely overlooked in the forensic literature. As a matter of fact, though several papers focus on infant and early childhood, few forensic studies have concentrated on older children and adolescents, and besides, the few papers on adolescent deaths are only addressing specific aspects of adolescent deaths (1). Furthermore, there is hardly any study on the age period from 4 to 9 years old.

Thus, the present study was undertaken to address this particular issue of child and adolescent victims in forensic autopsies. Considering that adolescence is defined by the World Health Organization (WHO) as the period of life between 10 and 19 years (2), the studied age group was extended accordingly. A better understanding of typical deaths in the 4–19 age group would bring a working basis for the forensic pathologist or medical examiner/coroner.

Materials and Method

In the province of Quebec (Canada), all forensic autopsies are performed at a centralized laboratory. On a 5-year period (2000–2004), all forensic autopsy cases of children and adolescents from 4 to 19 years of age were retrospectively reviewed. The following characteristics were analyzed and compiled for each case: age, sex, manner of death, and cause of death. Since the goal of the present study is to describe typical deaths in the 4–19 age group in forensic practice, it should be emphasized that this study is based on forensic autopsies only and child or adolescent death cases closed by the Coroner's office without a forensic autopsy are not included.

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Results

Child and Adolescent Victims in Forensic Autopsy

During a 5-year period (2000–2004), a total of 223 cases of child and adolescent deaths were autopsied in the 4–19 years of age population. This represents 6.6% of all forensic autopsies for the same period. Of those, the majority of cases occurred in the 15–19 age group (139 cases), with the remaining cases equally distributed between the 4–9 and the 10–14 age groups (42 cases each). Male victims were more frequently encountered than female ones (148 males, 75 females), this male predominance being more obvious in the 15–19 age group (Table 1). Altogether, accident was the most frequent manner of death (44%), followed by homicide (24%), suicide (18%), undetermined (9%), and natural (4%).

Manners of death were then compared between age groups. Overall, accident remained the most frequent manner of death for the 4–19 age period (Table 2). However, this predominance of accident progressively decreases with age: 57% of forensic autopsies in the 4–9 age group, 50% in the 10–14 age group, and 38% in the 15–19 age group. Homicide was the second most common manner of death in the 4–9 age group (31%) and the 10–14 age group (19%), while suicide took over the second place in the 15–19 age group (25%), relegating homicide to the third place in this age group (24%). Accidents and suicidal cases are detailed in Tables 3 and 4, whereas homicidal cases will be further described below.

We also noticed an important gender difference in the manner of death (Table 5). As no surprise, males were more prone to die from accidents (47%) than females (37%). Suicide was also predominantly a male act (21% compared to 13% in females). On the contrary, homicide rates were higher in females (32% compared to 20% in males).

The gender difference in the manner of death is even more interesting when relating to age group as well (Table 6). As a matter of fact, while males in the 4–9 age group were more prone to die from accident (74%) than from homicide (17%), the opposite was observed for females (47% homicide compared to 37% accident). This predominance of accidental death persisted in males in the

TABLE 1—Gender in all child and adolescent deaths.

	4–9	10–14	15–19
Male	23 (55%)	24 (57%)	101 (73%)
Female	19 (45%)	18 (43%)	38 (27%)
Total	42 (100%)	42 (100%)	139 (100%)

TABLE 2—Manner of death by age group.

	4–9	10–14	15–19
Accident	24 (57%)	21 (50%)	53 (38%)
Homicide	13 (31%)	8 (19%)	33 (24%)
Suicide	0 (0%)	6 (14%)	35 (25%)
Natural	3 (7%)	1 (3%)	5 (4%)
Undetermined	2 (5%)	6 (14%)	13 (9%)
Total	42 (100%)	42 (100%)	139 (100%)

TABLE 3—Accident cases.

Type of Accident	Cases	
	n	%
Motor vehicle	40	40.8
Other blunt injury	8	8.2
House fire	18	18.4
Drowning	13	13.3
Other asphyxia	4	4.1
Intoxication	7	7.1
Firearm	4	4.1
Electrocution	2	2.0
Hypothermia	1	1.0
Sharp force	1	1.0
Total	98	100.0

TABLE 4—Suicide cases.

Method of Suicide	Cases	
	n	%
Hanging	18	43.9
Firearm	13	31.7
CO intoxication	4	9.8
Drowning	2	4.9
Fall from height	2	4.9
Hypothermia	1	2.4
Suffocation by plastic bag	1	2.4
Total	41	100.0

TABLE 5—Manner of death in relation to gender.

	Male	Female
Accident	70 (47%)	28 (37%)
Homicide	30 (20%)	24 (32%)
Suicide	31 (21%)	10 (13%)
Natural	2 (1%)	7 (9%)
Undetermined	15 (10%)	6 (8%)
Total	148 (100%)	75 (100%)

10–14 age group (58% of males victims compared to 39% of females ones). Though accidental deaths in this age group was the most frequent manner of death in both males and females, homicides were still more frequently encountered in females than males (28% of females for 12% of males). For both genders, a significant

rise in suicides was observed in the 10–14 age group compared to the 4–9. In the 15–19 age group, accident was once again the most frequent manner of death in males (39%), though less predominant in comparison with suicide (28%) and homicide (23%). The preponderance of homicide in females is no longer observed in this age group (26% in females compared to 23% in males). Suicide, on the other hand, was more common in males (28% in males for 18% in females).

In the present study, in 21 cases (9%), manner of death was ruled as undetermined. Of those, autopsy was limited by significant decomposition in 11 cases. In three other cases, even though cause of death was known (drowning, CO intoxication, and firearm injuries), manner of death stayed unclear. The remaining seven cases were undetermined as to cause and manner of death, though death related to epilepsy was suspected in three cases.

Child and Adolescent Homicide Victims

A total of 54 homicide cases (24 females and 30 males) were autopsied during the 5-year study period. The majority of homicides occurred in the 15–19 age group (61%), the remaining cases being distributed slightly more in the 4–9 age group (24%) than in the 10–14 age group (15%). The gender distribution of homicide cases in the different age groups shows a strong female predominant ratio in the 4–9 and 10–14 age groups (9:4 and 5:3 respectively), while the opposite situation was observed in the 15–19 age group (10:23).

Overall, the two most frequently encountered methods of homicide were firearm and sharp force, each at 27% of cases, followed by asphyxia (23%), blunt force (20%), and intoxication (3%). Homicidal asphyxia was due to strangulation (five cases), homicidal drowning (three cases), carbon monoxide in homicidal fire (three cases), suffocation (one case), and combined cases (one case of strangulation with choking on soil, one case of manual strangulation and drowning).

Pattern of homicidal methods presented however some differences between age groups (Table 7). In proportion, asphyxia was more commonly encountered in the younger age group (43% in the 4–9, compared to 10% and 19% in the 10–14 and 15–19 age groups respectively), while firearm and blunt force injuries demonstrated an opposite distribution, with higher rates in the 10–14 and 15–19 age groups. Surprisingly, sharp force injuries were associated with relatively similar rates throughout age groups.

In addition to age difference, gender was also associated with some disparities in pattern of homicidal methods (Table 8). As a whole, sharp force injuries were more frequent in females (32%), followed by asphyxia (21%) and firearm injuries (21%). In males however, death from firearms came first (31%), surpassing asphyxia (25%) and relegating sharp force injuries to third place, *ex-aequo* with blunt force injuries (22% each). It is also interesting to study this gender differentiation in relation to age (Table 9). Unfortunately, the small number of cases in each category at this level of analysis precluded valid assertions.

Discussion

In the 5-year period study, most child and adolescent cases were aged from 15 to 19 years. This distribution is consistent with the literature. Indeed, the vast majority of child and adolescent autopsies are performed in victims of less than 2 or 3 years or over the age of 14 (3,4). This lower representation of the 4–9 age group in autopsy cases may be an important factor in their sub-representation in the forensic literature.

TABLE 6—Manner of death in relation to gender and age group.

	4–19		10–14		15–19	
	Male	Female	Male	Female	Male	Female
Accident	17 (74%)	7 (37%)	14 (58%)	7 (39%)	39 (39%)	14 (37%)
Homicide	4 (17%)	9 (47%)	3 (12%)	5 (28%)	23 (23%)	10 (26%)
Suicide	0 (0%)	0 (0%)	3 (12%)	3 (17%)	28 (28%)	7 (18%)
Natural	1 (4%)	2 (11%)	0 (0%)	1 (6%)	1 (1%)	4 (11%)
Undetermined	1 (4%)	1 (5%)	4 (17%)	2 (11%)	10 (10%)	3 (8%)
Total	23 (100%)	19 (100%)	24 (100%)	18 (100%)	101 (100%)	38 (100%)

TABLE 7—Homicide victims by methods.*

	4–9	10–14	15–19	Total
Firearm	1 (7%)	3 (30%)	12 (33%)	16 (27%)
Sharp force	5 (36%)	3 (30%)	8 (22%)	16 (27%)
Asphyxia	6 (43%)	1 (10%)	7 (19%)	14 (23%)
Blunt force	1 (7%)	2 (20%)	9 (25%)	12 (20%)
Intoxication	1 (7%)	1 (10%)	0 (0%)	2 (3%)
Total	14 (100%)	10 (100%)	36 (100%)	60 (100%)

*Since more than one method was used in six cases, the number of methods is higher than the number of victims.

TABLE 8—Homicide methods by genders.*

	Male	Female
Firearm	10 (31%)	6 (21%)
Sharp force	7 (22%)	9 (32%)
Asphyxia	8 (25%)	6 (21%)
Blunt force	7 (22%)	5 (18%)
Intoxication	0 (0%)	2 (7%)
Total	32 (100%)	28 (100%)

*Since more than one method was used in six cases, the number of methods is higher than the number of victims.

4–9 Age Group

Forensic autopsies in the 4–9 age group were slightly more often performed on male victims (55%). Manners of death were predominantly accident (57%) and homicide (37%). No deaths due to suicide were identified in this age group during the 5-year period, consistent with previous studies (3,5).

Once again, males were more prone to accident (74% in males compared to 37% in females). This high proportion of males in accident cases was expected because boys tend to be more active than girls. Homicides however were more frequently encountered in females (47% in females for 17% in males). This difference is not merely an effect from a higher percentage of accident in males, thus decreasing their homicides percentage. Indeed, the total

number of female homicide victims was more than twice the number of male homicide victims.

Furthermore, the leading method of homicide in this age group was asphyxia (43%), closely followed by sharp force injuries (36%). Other homicidal methods included firearm injuries (7%), blunt force injuries (7%), and intoxication (7%).

10–14 and 15–19 Age Groups

Batalis and Collins reviewed all forensic autopsies of adolescent deaths from 10 to 19 years of age, at the Medical University of South Carolina Forensic Pathology Department over a 15-year period (1). The manners of death in their population studied differ greatly from ours, especially in the 15–19 age group. Indeed, in their study, homicide was the main manner of death in this latter age group (38%), followed by accident (33%) and suicide (17%). In our study, both accident (38%) and suicide (25%) outnumbered homicide (24%), relegating this manner of death to the third place. As for the 10–14 age group, the manner of death in the study of Batalis and Collins, from most common to least common, was accident (47%), natural (21%), and homicide (18%) compared to accident (57%), homicide (31%), and natural (7%) in our population. Therefore, it seems that the homicidal rate is higher in younger teens in Quebec compared to South Carolina, while it is the opposite for older teens.

In accidental cases, male decedents have been reported to outnumber female decedents nearly 3:1 in adolescents from 10 to 19 years of age (1). This result is relatively similar to the 5:2 ratio in the present study.

Amongst all suicides in adolescents from 10 to 19 years of age, males have been reported to account for about 71–86% of victims in the Western world (1,3). In keeping with this observation, we found a 76% preponderance of males in suicide.

Homicidal deaths in adolescents from 10 to 19 years of age in South Carolina (1) were mainly due to firearm injuries (82%), the remaining cases being related to sharp force injuries (8%), blunt force injuries (7%), and asphyxia (3%). Though firearm was also the main homicidal method in our study, when taking the 10–14 and 15–19 age groups together, we did not observe such an

TABLE 9—Homicide methods in relation to gender and age group.*

	4–19		10–14		15–19	
	Male	Female	Male	Female	Male	Female
Firearm	0 (0%)	1 (10%)	1 (33%)	2 (29%)	9 (36%)	3 (27%)
Sharp force	1 (25%)	4 (40%)	0 (0%)	3 (43%)	6 (24%)	2 (18%)
Asphyxia	3 (75%)	3 (30%)	1 (33%)	0 (0%)	4 (16%)	3 (27%)
Blunt force	0 (0%)	1 (10%)	1 (33%)	1 (14%)	6 (24%)	3 (27%)
Intoxication	0 (0%)	1 (10%)	0 (0%)	1 (14%)	0 (0%)	0 (0%)
Total	4 (100%)	10 (100%)	3 (100%)	7 (100%)	25 (100%)	11 (100%)

*Since more than one method was used in six cases, the number of methods is higher than the number of victims.

outstanding dominance of firearm. Indeed, in our population, homicides by firearm represented 33% of adolescent homicides, relatively closely followed by sharp force injuries (24%), blunt force injuries (24%), asphyxia (17%), and intoxication (2%).

Conclusion

This study reveals new insight into the typical child and adolescent victims in forensic autopsy. A better knowledge of usual manners of death and homicidal methods during this period of life, in relation to gender and age group, may help forensic experts and investigators in approaching cases on the day to day basis. Further studies would be helpful to achieve this goal, especially in the less known 4–9 age group for which there were few Western studies to compare our data with.

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