Injury Patterns of Female Homicide Victims in South Africa

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Background: Injury patterns and interpretation of injuries in homicidal deaths are important components of medicolegal autopsies. The objective of this article is to describe the incidence of female homicides and their related injury patterns with reference to autopsy practices in South Africa.

Methods: A national retrospective mortuary-based study of homicides in women of 14 years and older in 1999 was conducted. Data were gathered from medical legal laboratory records, autopsy reports, and police interviews from a stratified multistage sample of 25 mortuaries.

Results: The most common cause of homicide was a gunshot wound injury, with a firearm mortality rate of 7.5/100,000 women, 14 years and older, in 1999, followed by sharp force injury (6.8/100,000) and blunt force injury (6.1/100,000). Gunshot victims were more likely to be African, and those killed by sharp force injury were more likely colored.* Significantly, blunt force injury deaths occurred predominantly in intimate partner homicides. A full autopsy was performed only in 70% of cases. An assessment of postmortem reports revealed poor descriptions of the anatomic location of injuries and the specifications of wound dimensions.

Conclusions: South Africa has a high female homicide rate that exceeds reported rates with the cause of homicide varying by social group. Assessment of injury description suggests weaknesses in the documentation of injuries at autopsy. This weakens the forensic investigation and undermines the strength of evidence presented in court. Further measures are needed to strengthen forensic pathology services in South Africa.

Key Words: Female homicide, Homicide, Injury patterns, Medicolegal autopsy, Postmortem practices.

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South Africa is known as a particularly violent country, with homicide being one of the major public health challenges.[1,2] Burden of disease studies indicates that homicide is the leading cause of fatal injuries in South Africa.[3] According to the Inquest Act of 1959, medicolegal autopsies must be performed on all nonnatural deaths to determine the cause of death. The correct description and interpretation of injuries is an essential part in the process of establishing the cause of death, thereby assisting the criminal investigation. It is also indicative of good autopsy practices, which is an important component of the medicolegal investigation and is vital for convincing a court of the expertise of forensic examiners.

Homicide studies traditionally investigate incidence and patterns of homicide by exploring the age and sex of victims, relationship between victims and perpetrators, and the cause of death.[4–9] These studies have found that men are more likely to die a homicidal death and that blunt and sharp force injuries are the most common cause of homicide.[4–9] Most literature on injuries has presented small studies or case series data,[10–13] whereas only a few large-scale studies explore injury patterns of homicide victims, with mainly anatomic location of injuries documented.[4,9] Understanding location and type of injury in a South African setting is extremely important for understanding homicides. This information is critical in the medicolegal investigation of a homicide case thereby facilitating the proper forensic investigation of such cases.

Until recently, few studies have been published on female homicides in South Africa. The first study on the epidemiology and pathology of femicide in South Africa found a female homicide rate of 24.7/100,000 women, 14 years and older, which far exceeds reported rates from other countries.[14] This study provided the opportunity to analyze injury data, and in this article, we describe the injury pattern and cause of homicide of female homicide victims in South Africa and reflect on indicators of autopsy practices.

METHODOLOGY

This is a national retrospective mortuary-based study. The sampling frame consisted of all medical legal laboratories (MLLs) operating in South Africa during 1999. The MLLs were stratified based on the number of postmortems conducted per annum: small, <500 bodies; medium, 500–1,499 bodies; and large, ≥1,500 bodies. A stratified proportionate random sample of mortuaries was drawn yielding a sample of 25 MLLs. The study population comprises females, 14 years and older, whose death was by homicide and where the body was taken to an MLL between January 1, 1999 and December 31, 1999.

Data were collected between 2002 and 2003 from death registers, autopsy reports, police records, and recorded on a

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*Race was used based on the Apartheid classification system with "colored" referring to those of mixed race origin.
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pretested data collection sheet. Death registers at the sampled MLLs were the primary data source in the identification of female homicides. The identified autopsy reports were photocopied, and the forensic pathologist on the research team extracted the injury data. Data were also collected from police through interviews or record reviews.

Data obtained from MLLs included police case information, details around the death, and demographic characteristics of the victim. Data derived from the police included sociodemographic characteristics of the victim and perpetrator, victim-perpetrator relationship, and information on the case investigation and outcome. The perpetrator was defined as the person whom the investigating officer perceived as primarily responsible for the murder. If there was reasonable doubt or no suspect, the perpetrator was classified unknown. The victim-perpetrator relationship was classified as intimate and nonintimate.

The autopsy report provided data on location of injuries, number of injuries, cause of death, specimen collection, and evidence of pregnancy. Cause of homicide was categorized for this study as gunshot wound, sharp force injury, blunt force injury, strangulation, and others that included asphyxiation, poisoning, drowning, fire, and undetermined deaths. To determine the standard of the autopsy report, a score ranging from 1 = <25%, 2 = 25%–50%, 3 = 51%–74%, 4 = 76%–99% to 5 = 100% was assigned based on injury documentation. The documentation was assessed based on description of the location of injuries, pathologic description of injuries, and whether wound dimensions were specified. The assessment was done during the process of transcription by the forensic pathologist on the team using standard wound description guidelines.[15]

Stata 8.0 was used in the analysis,[16] and the sampling, stratification, and weighting of the MLL were taken into account. This allowed us to calculate mortality rates by cause of homicide using population estimates from the 1996 South African census after adjusting for annual population growth.[17] Frequencies and 95% confidence intervals (CIs) were used to describe victim and perpetrator sociodemographic characteristics and injury patterns by cause of homicide. χ^2 tests were conducted to check for significant differences between the groups.

RESULTS

Access was gained to all sampled MLLs, and data were collected from all study sites. A sample of 1,052 female homicides was identified for the year 1999. Autopsy reports could not be traced in 39 cases, and this analysis is based on 1,013 female homicide cases. In cases where injury data were known, we estimate that a total of 3,437 (95% CI: 2,533 to 4,327) female homicides occurred in South Africa in 1999. The most common cause of homicide was a gunshot wound injury (n = 1,145) with a firearm mortality rate of 7.5/100,000 women, 14 years and older. This was followed by a mortality rate due to sharp force injury of 6.8/100,000 women, 14 years and older (n = 1,045) and that due to blunt force injury of 6.1 of 100,000, 14 years and older (n = 941).

The victims' social and demographic characteristics are presented in Table 1. Overall, victims of female homicide had a median age of 33, with no difference in median age by cause of homicide. The age pattern was similar for gunshot wounds, sharp force injuries, and blunt force injuries. Of significance, a difference between victims who were strangled and the overall female homicide group was found, with a greater proportion (28.8%) of older women within this group ($p < 0.00$). The race profile of female homicides by cause of homicide is noteworthy. Gunshot victims were more likely African women, and less likely to be colored* women ($p < 0.00$) compared with all female homicides. Colored women were also more likely to be stabbed ($p = 0.02$). Victims who were strangled were more likely to be white but less likely to be African compared with the overall homicide group ($p < 0.00$). Those killed by a firearm were more likely to be employed as skilled workers and killed in their home compared with the other groups ($p < 0.00$). Of note, comparing when the murder occurred by cause of homicide shows that sharp force deaths were more likely to occur during weekends ($p = 0.04$), whereas strangulation deaths were more likely to occur during the week ($p = 0.01$). Victims who were stabbed compared with the overall group were also more likely to be pregnant at the time of their murder ($p = 0.05$). The perpetrators' racial profile shows that most homicides were interracial. The relationship characteristics show that those killed by intimate partners were significantly more likely to be murdered by blunt force ($p = 0.05$), whereas those killed by nonintimate partners were more likely to be strangled ($p < 0.00$) compared with all female homicides. When victims were killed by a gun there was a greater likelihood of more than one victim, with this often being other family members such as children ($p < 0.00$), whereas multiple victims were less likely to be associated with blunt force ($p = 0.03$) compared with all homicides.

Table 2 shows type of autopsies and injury patterns for victims by cause of homicide. Of note, a full autopsy was performed only in 70% of all cases. Single injuries were more likely when a gun was used in the killing ($p < 0.00$), whereas multiple injuries were more likely with blunt force ($p < 0.00$) compared with all cases. Overall, the head and face, and thorax were the most common location of injuries in female homicides. Importantly, pattern of injuries differed by cause of homicide. Head and face injuries were more likely to have blunt force injuries, and neck injuries were most common in strangulation deaths whereas thoracic injuries were more likely caused by sharp force injuries. Overall, genital injuries were not common, but when found they were significantly more likely among strangulation deaths compared with all homicides. The most common type of injuries were contusions of the head and face (26.6%) and intracranial hemorrhage (25.9%) of the head followed by penetrating incised wounds (22.5%) of the thorax (data not shown in table).

Table 3 shows that the pathologic description of wounds were best documented, whereas the anatomic location of injuries were overall poorly described. The greatest variation in the documentation of injuries by cause of death was found in the anatomic location of injuries. Sharp force

TABLE 1. Social and Demographic Characteristics of Female Homicide Victims by Cause of Homicide (Weighted Estimates)

	Gunshot Injury, % (95% CI) (n = 387) n = 1,145 (Weighted)	Sharp Force Injury, % (95% CI) (n = 262) n = 1,045 (Weighted)	Blunt Force Injury, % (95% CI) (n = 345) n = 941 (Weighted)	Strangulation, % (95% CI) (n = 81) n = 225 (Weighted)	All Female Homicides, % (95% CI) (n = 1,013) n = 3,437 (Weighted)
Median age (yr)	32 (14–85)	32 (14–83)	33 (14–83)	33 (14–91)	33 (14–91)
Age (yr)					
14–39	69.0 (59.7–77.0)	70.7 (61.8–78.3)	68.1 (61.1–74.3)	47.7 (37.9–57.5)*	67.5 (62.5–72.2)
40–59	19.6 (14.2–26.5)	23.1 (16.8–30.9)	22.7 (16.4–30.6)	23.6 (14.3–36.5)	22.6 (19.0–26.8)
60+	11.4 (5.0–23.8)	6.2 (3.4–11.1)	9.2 (4.9–16.4)	28.8 (18.7–41.6)	9.8 (6.4–14.8)
Race					
African	86.8 (79.0–92.0)*	72.0 (48.9–87.4)*	77.2 (63.5–86.8)	63.1 (39.1–81.9)*	78.8 (64.4–88.4)
Colored	5.7 (1.9–15.6)	24.8 (10.4–48.4)	15.2 (7.4–28.8)	14.7 (4.8–37.3)	14.7 (6.4–30.4)
White	4.7 (2.2–10.0)	3.1 (1.7–5.8)	6.8 (3.2–13.9)	21.4 (9.6–41.0)	5.3 (3.2–8.6)
Indian	2.8 (1.1–6.9)	0.0	0.8 (0.2–4.0)	0.8 (0.1–6.1)	1.2 (0.4–3.0)
Occupation					
Unskilled	10.0 (5.2–18.4)*	15.6 (8.9–25.8)	12.4 (6.7–21.3)	5.3 (1.8–14.5)	13.8 (9.9–19.1)*
Skilled	16.3 (10.9–23.7)	4.3 (1.3–13.4)	2.1 (0.7–6.1)	4.2 (2.0–8.6)	7.1 (4.3–11.3)
Unemployed/housewife	55.9 (42.9–68.1)	64.5 (52.3–75.1)	68.3 (53.0–80.4)	54.3 (42.4–65.8)	63.4 (55.7–70.3)
Others†	17.8 (8.9–32.2)	15.6 (9.3–24.8)	17.3 (8.9–30.8)	36.2 (24.3–50.1)	15.8 (11.4–21.5)
Relationship between victim and perpetrator					
Nonintimate	51.7 (40.8–62.4)	50.7 (41.8–59.6)	38.5 (28.4–49.7)*	70.0 (49.4–84.8)*	49.3 (43.3–55.4)
Intimate	48.3 (37.6–59.2)	49.3 (40.4–58.2)	61.5 (50.3–71.6)	30.0 (15.2–50.6)	50.7 (44.6–56.7)
Scene of injury					
Home	65.9 (55.6–74.9)*	47.2 (38.8–55.6)	52.0 (39.8–64.0)	54.6 (41.8–66.8)	53.6 (47.9–59.2)
Other	34.1 (25.1–44.4)	52.8 (44.3–61.2)	48.0 (36.1–60.2)	45.4 (33.2–58.2)	46.5 (40.8–52.1)
Part of week					
Weekdays	46.1 (39.9–52.4)	38.0 (29.6–47.1)*	43.1 (35.1–51.3)	67.6 (49.1–81.8)*	44.3 (39.4–49.2)
Weekends	53.9 (50.8–60.6)	62.0 (52.9–70.4)	56.9 (48.6–64.9)	32.4 (18.2–50.9)	55.7 (50.8–60.6)
More than one victim	20.1 (13.8–28.5)*	9.3 (4.8–17.2)	5.2 (2.4–11.1)	5.9 (1.8–18.3)	11.2 (8.0–15.4)

* A significant difference of $p \leq 0.05$ between cause of homicide and all female homicides.
† Includes pensioner, student, and sex worker.

TABLE 2. Type of Autopsy and Number and Location of Injuries in Female Homicide Victims by Cause of Homicide (Weighted Estimates)

	Gunshot Injury, % (95% CI) (n = 387) n = 1,145 (Weighted)	Sharp Force Injury, % (95% CI) (n = 262) n = 1,045 (Weighted)	Blunt Force Injury, % (95% CI) (n = 345) n = 941 (Weighted)	Strangulation, % (95% CI) (n = 81) n = 225 (Weighted)	All Female Homicides, % (95% CI) (n = 1,013) n = 3,437 (Weighted)
Full autopsy	70.3 (50.9–84.4)	64.0 (45.4–79.1)	76.2 (53.5–89.9)	77.9 (45.9–93.6)*	70.4 (55.1–82.2)
Injuries					
Single	67.4 (59.8–74.2)*	60.6 (50.4–70.1)	32.2 (22.9–43.3)*	62.1 (46.7–75.4)	58.2 (52.8–63.4)
Multiple	32.6 (25.8–40.2)	39.4 (29.9–49.6)	67.8 (56.7–77.1)	37.9 (24.6–53.3)	41.8 (36.6–47.2)
Location of Injuries					
Head and face	63.7 (55.6–71.0)	42.9 (35.1–51.0)*	94.6 (87.1–97.8)*	67.6 (42.9–85.2)	64.1 (59.4–68.5)
Neck	21.1 (9.0–18.1)*	39.9 (30.0–50.6)*	27.2 (19.9–36.0)	95.3 (83.1–98.8)*	31.6 (26.7–36.8)
Thorax	53.7 (44.9–62.2)	82.2 (71.6–89.5)*	57.6 (48.5–66.1)	44.5 (26.5–64.1)	59.3 (54.6–63.9)
Abdomen and lower back	27.3 (20.2–35.8)	24.2 (19.4–29.8)	38.4 (27.2–51.0)*	20.9 (11.7–34.7)	27.5 (22.2–33.5)
Pelvis and buttocks	9.6 (6.3–14.2)	8.4 (4.8–14.3)	23.1 (15.5–32.8)*	8.4 (3.2–20.6)	12.5 (9.2–16.8)
Upper limbs	28.6 (22.0–36.2)*	40.6 (31.0–51.0)	50.7 (40.5–60.9)*	38.5 (23.5–56.0)	37.0 (32.3–42.1)
Lower limbs	15.9 (10.9–22.6)*	13.2 (8.8–19.3)*	40.9 (29.5–53.4)*	28.0 (14.2–47.7)	22.7 (17.5–28.9)
Genital	1.3 (0.4–3.8)*	1.7 (0.5–5.6)*	5.6 (2.4–12.4)	11.8 (3.4–33.4)*	4.1 (2.3–7.0)
Anal	0.8 (0.1–4.1)	0.2 (0.0–1.3)*	0.4 (0.1–1.6)*	1.7 (0.5–6.1)	1.3 (0.8–2.4)

* A significant difference of $p \leq 0.05$ between cause of homicide and all female homicides.

TABLE 3. Injury Description of Female Homicide Victims by Cause of Homicide (Weighted Estimates)

	Gunshot Injury, % (95% CI) (n = 387) n = 1,145 (Weighted)	Sharp Force Injury, % (95% CI) (n = 262) n = 1,045 (Weighted)	Blunt Force Injury, % (95% CI) (n = 345) n = 941 (Weighted)	Strangulation, % (95% CI) (n = 81) n = 225 (Weighted)	All Female Homicides, % (95% CI) (n = 1,013) n = 3,437 (Weighted)
Anatomic location of injury					
<25%	29.9 (15.6–49.5)	28.0 (14.2–47.6)	21.1 (11.2–36.0)	21.6 (5.6–56.0)	25.4 (14.5–40.6)
26%–50%	8.7 (4.5–16.0)	12.56 (6.4–23.2)	7.8 (3.3–17.5)	1.7 (0.4–7.0)	8.7 (5.3–14.0)
51%–74%	8.7 (3.9–18.3)	15.0 (6.7–30.3)	9.8 (5.2–17.8)	3.0 (0.4–19.6)	9.9 (5.6–17.1)
76%–99%	16.9 (9.0–29.4)	13.2 (6.5–25.0)	11.3 (5.0–23.6)	5.0 (1.3–16.9)	12.6 (7.7–19.9)
100%	35.9 (18.1–58.6)	31.3 (15.4–53.2)	50.1 (33.7–66.4)	68.7 (40.4–87.7)	43.4 (28.0–60.1)
Pathological description of injury					
<25%	9.0 (2.9–24.6)	11.7 (5.1–24.1)	6.9 (2.2–19.5)	13.1 (1.8–55.8)	9.3 (3.7–21.4)
26%–50%	1.1 (0.3–3.7)	1.6 (0.3–8.9)	1.7 (0.3–7.7)	0.0	1.3 (0.5–3.4)
51%–74%	2.1 (0.3–1.3)	0.4 (0.1–1.4)	0.2 (0.0–1.5)	0.8 (0.1–6.1)	0.9 (0.2–4.1)
76%–99%	5.7 (1.3–22.1)	4.4 (1.9–9.9)	1.4 (0.2–8.5)	3.9 (0.7–19.7)	3.8 (1.7–8.3)
100%	82.1 (59.6–93.4)	82.0 (66.1–91.4)	89.8 (80.1–95.1)	82.3 (46.9–96.1)	84.7 (72.2–92.2)
Specification of wound dimensions					
<25%	39.0 (20.7–61.1)	21.3 (10.4–38.7)	37.8 (21.3–57.7)	39.3 (16.8–67.6)	33.9 (21.6–48.9)
26%–50%	1.3 (0.3–4.6)	4.1 (1.2–13.4)	6.9 (2.7–16.3)	2.5 (0.5–11.0)	3.2 (1.4–6.9)
51%–74%	1.3 (0.3–6.2)	3.2 (1.0–10.2)	2.8 (1.0–7.6)	0.8 (0.1–7.1)	1.8 (0.8–4.3)
76%–99%	0.5 (0.1–3.1)	0.5 (0.1–2.3)	2.7 (1.1–6.9)	1.7 (0.4–6.6)	1.1 (0.5–2.5)
100%	57.9 (37.8–75.6)	70.8 (53.1–83.9)	49.8 (29.8–69.8)	55.7 (28.6–79.7)	60.1 (44.7–73.7)

injury deaths showed the largest variation in injury description with the specification of wound dimensions best described for such homicides.

DISCUSSION

This study has shown that in South Africa, gunshot wounds are the most common cause of homicide when women are murdered. This is similar to the overall pattern of homicide in South Africa where firearm homicide is the leading cause of injury deaths.[3] It contrasts with findings from countries in Europe and Asia and reflects the widespread availability of firearms in South Africa.[6,8,18] Studies have shown that firearm homicide seems to be more common in countries with high levels of violent crime such as Latin America, the Caribbean, and the United States.[19–21] This study finding of a firearm homicide rate of 7.5/100,000 women, 14 years and older, per annum seems to be one of the highest documented female firearm homicide rates, with the only comparable rate from the United States of 1.54/100,000 women.[22] Single injuries were also more likely when a gun was used. This pattern would suggest that the availability of guns and the lethality thereof render women particularly vulnerable and reduces their chances of resisting when attacked by a gun. The role of firearms was also highlighted in the analysis of intimate-femicide suicides from this study.[23] Legal gun ownership was associated with the double murder where the killing of an intimate partner is followed by the committing of suicide after the murder. South Africa has recently reformed its legislation on firearms restricting legal gun ownership. The Firearm Control Act of 2000 has shown an impact with a decrease in deaths due to gunshot injuries; however, the problem posed by illegal gun ownership still remains.[24] Countries where gun access is restricted have lower levels of gun violence, and, therefore, alternative strategies to control gun access needs to be explored as policy alone is not enough.[21]

Few studies on injuries have explored female homicide. This study has shown that female homicide victims are generally young with a median age of 33 years. This finding is corroborated by homicide studies, which find that younger men and women are generally victims of violence, with women being at increased risk of intimate partner violence at this age.[20,25,26] Overall, the age pattern for female homicides also shows that women are less likely to be murdered as they become older. However, when women were strangled, we observed a different age pattern with a larger proportion of older women in this group. Genital injuries were more likely in deaths due to strangulation, which were also due to a nonintimate partner. In an analysis of rape homicides from these data it was found that strangulation was strongly associated with this form of murder.[27] This suggests that a different dynamic exists in cases of strangulation compared with other causes of death.

Of note, blunt force injury deaths were more likely to occur when the perpetrator was an intimate partner. This is in contrast to that found in the United States where firearms were most likely to be used during intimate partner homicides.[28,29] This type of injury death was also more likely to have injuries to the head and face. This is similar to the findings from studies on acute injury patterns of intimate partner violence victims where head, neck, and face injuries were found to be predictive of intimate partner violence.[30,31]

This study has shown that certain social groups were more likely to be killed in some ways than others. Colored

women were more likely to be killed by sharp force injury and less likely to be killed by guns. Violent crime, in particular, homicide rates among the colored group exceeds those of other race groups in South Africa.[32] Criminologists ascribe these excessive rates to a culture of violence within these communities, with intimate partner femicide also overrepresented within this group.[14,32] Sharp force injuries indicate the physical nature of the attack, which is often of an interpersonal nature and by a known perpetrator.

The assessment of injury description indicates that documentation of injuries was inconsistent. The poor scoring on the anatomic description of injuries is an indication of weaknesses in autopsy practices. This is of concern as it is an important component of the medicolegal investigation. South Africa has a low murder conviction rate and opportunities to collect forensic evidence may be lost if autopsy practices are inadequate.[33] The accurate documentation of injuries is critical in facilitating the forensic investigation and criminal justice process. Yet, only 70% of these homicide cases had a full autopsy performed. During data collection it became apparent that in some instances bodies were prepared by the mortuary assistant and only viewed by the examining doctor. This finding was corroborated by a small study, which found that more than half of the examining doctors do not perform a standard autopsy in all cases.[34] This finding highlights the need for further investigation into autopsy practices, and standards and measures to strengthen these.

CONCLUSION

This study is the first in South Africa to provide a description of injury patterns for victims of female homicide. The findings highlight the high rate of mortality due to gunshot wounds. Importantly, the study found that blunt force injury deaths are more likely to be committed by an intimate partner and that certain patterns of injury are associated with particular causes of death. It was also found that the documentation of injuries was not of a consistent standard reflecting inadequate autopsy practices. However, little is known on how autopsy practices contribute to the criminal investigation and its outcome. Developing this understanding is, therefore, critical for improving the investigation of homicide in South Africa and thereby bringing justice to the women killed.

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