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Variation of gunshot injury patterns in mortality associated with human rights abuses and armed conflict: an exploratory study

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ABSTRACT

The analysis of the distribution of gunshot injuries in a sample of 777 sets of human remains of proven human rights abuse from Somaliland, the Balkans and Peru is compared to frequencies of injuries sustained by combatants in contemporary conflicts reported in the literature. Principal Component Analysis (PCA) reduced the data to three components accounting for 82.94% of the variance. The first component with 38.31% of variance shows segments Arms and thorax/abdomen to be positively correlated (0.887 and 0.662, respectively); the segment head/neck is strongly correlated (0.951) to the second component while the segment thorax/abdomen shows a low, negative correlation (−0.388). Finally in the third component only the legs are strongly correlated (0.991). Data was further subjected to a K-means cluster analysis to determine the likely groupings combining the four types of injuries. Each of the three clusters reproduced similar patterns observed in the PCA: Cluster 1 shows the prevalence of injuries to the thorax/abdomen and extremities in addition to injuries to the head/neck; Cluster 2 shows injuries to the head/neck and Cluster 3 injuries to the thorax/abdomen and a lower representation of the arms and legs. Most of the cases (70.5%), irrespective of geography and type of site (attack or detention), were grouped into Cluster 2. Such comparison shows that in human rights abuse, irrespective of their geography, gunshot injuries tend to follow a pattern favouring the head/neck and thorax/abdomen areas over the extremities, the reverse pattern observed in contemporary combat operations. In those settings gunshot wound trauma is the second cause of mortality/morbidity (after fragmenting ammunition) and its distribution concentrates on the extremities, thorax/abdomen and head; following the pattern of protective armour when it is used. Considering that human rights abuses are often presented as encounters between two armed groups in the context of counter-insurgency operations, a careful analysis of gunshot injury patterns could serve as an indicator that in fact murder, rather than combat, took place and the intention was to kill rather than to maim or render people unfit for battle.

Objective: To compare the variation of gunshot injury patterns between mortality associated with human rights abuses and armed conflict in selected samples from different countries.

Design: Literature review and case analysis.

Settings: Original statistical analysis of gunshot injuries on human remains (n = 777) recovered from mass or clandestine graves associated with human rights abuses in countries in Somaliland, the Balkans and Peru (1983–1995) and literature review of mortality caused by armed conflicts.

Main outcome measure: Mechanism of gunshot injury and wound distribution pattern in geographically diverse samples of human rights abuse.

1. Introduction

A large body of evidence presented in Courts or Commissions of Enquiry during the past twenty years in different jurisdictions has attested to human rights abuses in various countries [1–10]. Investigations of such abuses combine witness testimony with forensic evidence such as the context in which human remains were found and the distribution of injuries that resulted in the death of victims. However, no investigation has focused on whether the bodily distribution of injuries in itself may assist to suggest whether people died in battle or if they were subject of human rights abuses, irrespective of time frame and geography. This is a particularly poignant fact in such cases as they typically involve not one but hundreds or thousands of victims in a single case such as Srebrenica [25,29–31,58].

While many tools are presently available for investigators to establish the extent to which "collateral" damage to civilian populations may constitute war crimes [2–4], little has been achieved interpreting data derived from human remains recovered from mass graves or clandestine burials associated with human rights abuses. Also recently, "revisionist" theories attempting to challenge the occurrence of proven crimes categorised, in some instances as Genocide, have proliferated [16,17]. Such challenges do not only concern the number of mortal

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victims but the way in which they died, in other words, whether they were casualties of war or the result of extrajudicial killings. Perhaps the most important question to be asked is whether extrajudicial killings can take place within the context of war and whether those deaths are significantly different from mortality in war. Coupland and Meddings [5] proposed the term "weapons of volition" for firearms implying the distribution of injuries in the body reflects the will of the shooter in aiming at specific parts of the body; unlike the use of fragmenting ammunition in which the outcome is less predictable. No study has yet attempted to establish what characterises the distribution of injuries caused by firearms in the context of armed conflict or internal unrest in cases of proven violations against International Human Rights Law (IHRL) or International Humanitarian Law (IHL). This exploratory study presents a comparison between injury data extracted from postmortem examination of remains from victims of human rights abuse from countries in three geographically distinct areas of the world and injury data derived from contemporary conflicts. The objectives are to determine whether differences in injury patterns between human rights and contemporary conflict exist, and whether differences between and amongst geographically different sites are also present.

2. Material and methods

Injury data was extracted from autopsy reports on 1069 cases corresponding to an equal number of individuals from 33 sites in Bosnia, Kosovo, Somaliland and Peru (Table 1). The remains at the time of analysis were in various states of preservation ranging from saponified through skeletonised. Only injuries with obvious traumatic stigmata in which the causative mechanism was established as gunshot during postmortem examination were included in the study reducing the sample to 777 cases from 31 sites (two sites from Peru, Pucamarca and Putca were excluded since they did not show gunshot injuries but a combination of sharp and blunt force trauma injuries only). Any injuries classified as "possible", "cannot tell" or "mechanism of injury unknown" were excluded. The body was topographically divided into four segments (head/neck, thorax/abdomen, arms and legs) and no distinction was made between sides. For purposes of classification, only the primary location of the injury was recorded. For example, a gunshot wound originating on the right arm with exit through the left anterior part of the chest would be recorded under "arm". The elaboration of data however focuses on gunshot injuries. Injury data was extracted from autopsy reports into a spreadsheet indicating case number, age, sex and the number of injuries per body segment, namely head/neck, thorax/abdomen, arms and legs. Injury data was recorded as numerical (scale) variables.

Cases from Bosnia and Kosovo date from the period 1992 to 1999. The cases from Bosnia include some of the sites associated to the Srebrenica (1995) [18] massacre as well as, ethnic cleansing in North West Bosnia (1992) [15]. Pathologists in collaboration with anthropologists hired by the International Criminal Tribunal for the former Yugoslavia (ICTY) between 1997 and 2001 prepared autopsy reports. The remains from Kosovo represent people killed, buried and later exhumed, and then transported to the Republic of Serbia by Serbian Armed forces [19]. All cases from the Balkans were commissioned by and tendered as evidence by the Office of the Prosecutor, International Criminal Tribunal for the former Yugoslavia. Autopsy reports were

Table 1
List of sites and demographic distribution of the total sample (n = 1069).

Country	Actor	Attack/Detention	Site code	0–13 years	14–25 years	+26 years	Male	Female	Indet.
Bosnia* [29]	M, PM	A	Nova Kasaba 01	0.0	1.0	0.0	1.0	0.0	0.0
Bosnia* [29]	M, PM	A	Nova Kasaba 04	0.0	5.0	14.0	19.0	0.0	0.0
Bosnia* [29]	M, PM	A	Nova Kasaba 06	0.0	1.0	1.0	2.0	0.0	0.0
Bosnia* [29]	M, PM	A	Nova Kasaba 07	0.0	0.0	1.0	1.0	0.0	0.0
Bosnia* [29]	M, PM	A	Nova Kasaba 08	0.0	10.0	17.0	27.0	0.0	0.0
Bosnia* [29]	M, PM	A	Ravnice 02	1.0	32.0	96.0	129.0	0.0	0.0
Bosnia* [29]	M, PM	A	Ravnice 01	1.0	2.0	16.0	19.0	0.0	0.0
Bosnia* [29]	M, PM	A	Kozluk 02	0.0	6.0	11.0	17.0	0.0	0.0
Bosnia* [29]	M, PM	A	Kozluk 03	0.0	16.0	120.0	136.0	0.0	0.0
Bosnia [30]	M, PM	A	Jakarina Kosa	0.0	14.0	125.0	132.0	4.0	3.0
Kosovo** [31]	M	A	Batajnica 02	0.0	1.0	5.0	6.0	0.0	0.0
Kosovo** [31]	M	A	Batajnica 03	0.0	1.0	31.0	31.0	1.0	0.0
Kosovo** [31]	M	A	Batajnica 05	0.0	16.0	57.0	70.0	3.0	0.0
Kosovo** [31]	M	A	Derventa sites	0.0	7.0	10.0	17.0	0.0	0.0
Kosovo** [31]	M	A	Petrovo Selo I	0.0	1.0	7.0	7.0	1.0	0.0
Kosovo** [31]	M	A	Petrovo Selo II	0.0	6.0	25.0	29.0	2.0	0.0
Peru [32,33]	M	D	Cabitos	1.0	25.0	28.0	46.0	7.0	1.0
Peru [34]	M	A	Santa Rosa	0.0	0.0	12.0	12.0	0.0	0.0
Peru [35]	M	A	Pichari	0.0	12.0	13.0	25.0	0.0	0.0
Peru [36]	M	D	Pucayacu	0.0	9.0	26.0	35.0	0.0	0.0
Peru [37]	P	D	Chaupiorcco	0.0	0.0	5.0	3.0	2.0	0.0
Peru [38]	M	A	Putis	26.0	9.0	38.0	29.0	42.0	2.0
Peru [39]	M	A	Chilcahuayco	1.0	6.0	12.0	8.0	8.0	3.0
Peru [40]	M	A	Huarcatan	0.0	6.0	13.0	18.0	0.0	1.0
Peru [41]	M	A	Huamanquiquia	0.0	9.0	9.0	17.0	0.0	1.0
Peru [42]	M	A	Rumichaca	0.0	1.0	4.0	4.0	1.0	0.0
Peru [43]	PM	A	Pucamarca	0.0	3.0	3.0	6.0	0.0	0.0
Peru [44]	PM	A	Cabana	0.0	3.0	6.0	8.0	1.0	0.0
Peru [45]	PM	A	Putca	19.0	3.0	15.0	6.0	17.0	14.0
Peru [46]	M	A	Ccoril	1.0	0.0	2.0	1.0	1.0	1.0
Peru [47]	M	A	Umasi	3.0	22.0	9.0	20.0	5.0	9.0
Peru [48]	M	A	Huarapite	1.0	7.0	11.0	9.0	8.0	2.0
Somaliland [49]	M	A	Badhka	0.0	15.0	24.0	36.0	0.0	3.0

* Sites linked to the fall of Srebrenica, July 1995
**Victims originated in Kosovo but were found in mass graves in Serbia proper
M: Military; Armed Forces of any of the three branches
PM: Paramilitary or irregular forces with military capacity sponsored by the State or belonging to insurgent groups; self-defense forces P: Police; A: Attack; while most of the Srebrenica sites included in this study can be classified as attack, many of them were in fact people rounded or ambushed while fleeing the enclave; in those circumstances a certain time may have elapsed between being captured and being killed; D: Detention refers to people formally taken into custody, kept in a facility for a number of days and then executed.
*** Unknown with no sexual estimation due to age (children and babies) or damaged diagnostic areas.