Research Paper

Trauma

Multiple correspondence analysis as a strategy to explore the association between categories of qualitative variables related to oral–maxillofacial trauma and violent crimes at the community level

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Abstract. The main objective of this study was to show the applicability of multiple correspondence analysis (MCA) in the detection and representation of underlying structures in large datasets used to investigate oral–maxillofacial lesions. A cross-sectional study was conducted involving the analysis of the medical–forensic and social records of 992 people who experienced oral–maxillofacial trauma resulting from non-fatal violent crimes that occurred in the community. Based on the MCA results, two distinct victim profiles were identified. The first profile was characterized by adult men, victims of instruments of violence (such as firearms, knives, or mixed aggression), resulting in severe trauma, mainly affecting the upper or middle third of the face. The second profile was characterized by adolescent and young adult women, victims of aggression using physical force, resulting in soft tissue traumas, mainly affecting the lower third of the face or more than one region at the same time. MCA has been demonstrated to be a powerful tool for exploring complex data related to oral–maxillofacial trauma, showing whether there is a relationship and how variables are related. This multivariate method can also be very valuable in the study of several outcomes in oral and maxillofacial surgery and supporting specialties.

Violence is currently a serious public health problem in view of its magnitude and impact on the health of the population in several countries[1–4]. Among the different modalities, violence at the community level has received increasing attention by the scientific community. This specific type of violence includes exposure to intentional acts of aggression perpetrated in public areas by individuals who are not closely related to the victim and may occur in different ways, such as youth violence, assaults by strangers, and property crimes[5].

Violent crime can have a substantial impact on the health and well-being of victims and their families[3]. Experience of violence may be associated with health risk behaviours such as smoking, harmful use of alcohol and illicit drugs, and physical inactivity[6]. In addition, it can trigger emotional and psychological problems such as difficulty sleeping, lack of confidence, anxiety, depression, and post-traumatic stress disorder (PTSD)[4].

In Brazil, violence rates are a legitimate concern and many people, aware of the dangers within their communities, feel compelled to make changes to their lifestyles, and experience fear, social isolation, and a lack of security. Due to experiences of crime, many Brazilians exhibit growing fear and feelings that the country is insecure and violence can occur at any time. Attitudes such as not visiting certain places, not going out after dark, and avoiding leaving home alone are increasingly common[7–9].

Death represents the most serious consequence of crime. However, non-fatal injuries are much more common, destroying the well-being of communities. Among the different types of injury, it has been reported that maxillofacial traumas associated with physical violence represent a very common event, since the face is one of the most exposed regions of the body[9,10].

Maxillofacial traumas represent a serious public and economic health problem[1,2,11–14]. The face establishes the basis of all human interactions. Specific lesions in this region can lead to severe morbidity, cosmetic disfigurement, functional problems, increased time spent in health services, and absences from school and/or work, thereby having a disastrous and significant influence on quality of life from a three-dimensional perspective: organic, functional, and situational[10,15–18].

After conducting a comprehensive critical literature review, it was found that oral and maxillofacial traumas resulting from violence at the community level have received little attention from Brazilian researchers and from researchers around the world. Establishing the profile of victims, determining the circumstances in which violence emerges, and characterizing oral and maxillofacial traumas are essential to improve health care practices, to create clinical protocols, and to develop effective prevention strategies.

In this context, the aim of this study was to explore associations between categories of socio-demographic variables, circumstances of aggression, and characteristics of oral and maxillofacial traumas among victims of violent crime in the community using multiple correspondence analysis (MCA).

Materials and methods

Study design

A cross-sectional and exploratory study was performed based on the analysis of cases of oral–maxillofacial trauma resulting from violence at the community level attended to at the Centre of Forensic Medicine and Dentistry in the city of Campina Grande, state of Paraíba in north-eastern Brazil. This institution is a reference centre for 23 surrounding cities and provides care to victims of violence, covering a population of more than 680,000 inhabitants.

In Brazil, the law establishes that those who are victims of physical violence, when reporting abuse to the police, should be sent to the centres of forensic medicine and dentistry and a criminal investigation performed[19].

Eligibility criteria

All medical–legal and social records of oral–maxillofacial trauma cases resulting from community-level violence during a 2-year period (January 2010 to December 2011) were included, totalling 992 cases. Records with inconsistent/incomprehensible information were excluded.

Data collection

This study investigated the socio-demographic data of victims, the circumstances of the aggression, and the characteristics of the oral and maxillofacial traumas. A pilot study was conducted prior to this research. In the pilot study, three researchers underwent a training and calibration exercise for the data collection process. The exercise was performed using 30 different reports selected randomly from the year 2009 on two occasions, with an interval of 1 week. Intra-examiner and inter-examiner concordance was evaluated using the kappa test; kappa values of $\kappa = 0.85–0.90$ were obtained for both, indicating very good concordance.

A form was structured specifically for this study from information contained in the medical–legal and social records of victims. Part I comprised socio-demographic data including the victim's sex, age group, place of residence, marital status, schooling, and employment status. Part II comprised details of the circumstances of the aggression including the mechanism of aggression, aggressor's sex, day of occurrence, and time of occurrence. Part III comprised characteristics of the trauma including the type of maxillofacial trauma and the region of the face affected.
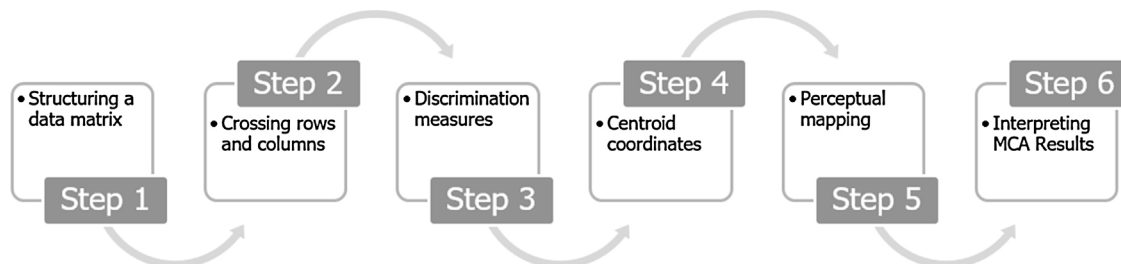

Fig. 1. Main steps to perform MCA.