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Forensic Odontology

ALARMING RATES OF BITE INJURIES IN THE BRAZILIAN JURISPRUDENCE – A SURVEY ON 1125 LAWSUITS DOCUMENTED OVER THE LAST 18 YEARS*.

Taxas alarmantes de lesões por mordidas na jurisprudência brasileira – Uma pesquisa em 1125 decisões judiciais publicadas nos últimos 18 anos.

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ASTRACT

Introduction: Physical violence became an important global problem in the last decades. This scenario is reflected in the increasing jurisprudence. In specific situations, perpetrators and victims of physical violence may inflict an especial patterned injury named bitemark. Knowing the case characteristics in lawsuits involving human bites and bitemarks is important to understand and encourage the role of Forensic Dentists as expert witness for bitemark analysis in Court. Objectives: The present study aimed to assess the jurisprudence to screen lawsuits that involve human bites and bitemarks in order to extract characteristics that could support research and practice of bitemark analysis. Material and methods: A systematic search was conducted in an open access jurisprudence system with the keywords “bite” and “bitemark”. Full-texts of lawsuits were selected and underwent data extraction. Results: A total of 2488 lawsuits were detected, from which 1125 were eligible in the present study. The lawsuits dated between 1997 (n=13, 1.15%) and 2015 (n=202, 17.95%). Forensic expertises were performed in 641 (56.97%) lawsuits, but the identity of suspects was investigated only in 3 (0.26%) cases. Conclusions: An increasing trend of lawsuits involving human bites and bitemarks was observed. Forensic Dentists must be aware of the current bitemark scenario as well the limitations inherent to bitemark analysis to face casework in the field. The present study provides evidence to encourage major education in bitemark analysis.

KEYWORDS

Forensic dentistry; Human bite; Jurisprudence; Lawsuits.

INTRODUCTION

The World Health organization (WHO)[1] defines violence as "the intentional use of physical force or power, threatened or actual, against oneself, another person, or against a group or community, which either results in or has a high likelihood of resulting in injury, death, psychological harm, maldevelopment, or deprivation"[1]. Currently, a global problem is detected within the increasing statistics in physical violence, which becomes an epidemic matter of public safety and health[2].

Specific populations are more vulnerable to physical violence, such as women[3,4], children[5] and elderly persons[6]. From a forensic scope, signs of violence must be investigated with an approach scientifically sound to support the Court optimally. These signs are reflected as injuries and sequels and may be detected during the forensic physical exam in the living or deceased. In especial situations, patterned injuries registering dental surfaces may be found characterizing a bitemark. This especial type of injury occurs both during the attack (performed by the perpetrator) and defense (performed by the victim) under a violent circumstance[7]. More rarely bitemarks also may be self-inflected[8,9].

The history of bitemarks cases indicates that these injuries are often associated with sexual crimes[10]. Victims of these crimes may evolve with aesthetic[11] and functional physical injuries[12], psychological disorders[10], and even death[13]. Legally, repercussions of bitemarks are found both in the civil and criminal Courts. In the first, forensic expertises in bitemarks injuries may be requested to quantify patrimonial and extra-patrimonial damages, while in the second these injuries may be typified based on its severity and may contribute to the characterization of a crime.

From the scope of Forensic Odontology, bitemark analysis also may be performed in Court to suggest if suspects could be excluded or not from a crime[10]. Specifically, exclusions are founded on potential discrepancies between the dental traits registered in the bite patterned injury and the dental traits observed in the suspect's dentition[10]. Additionally, the human dentition has class characteristics that enable distinction from other animals and may support the Court in defining the nature of injuries[14]. With similar principle, the dentitions of children and adults have significant differences[14] (especially in the shape and size of teeth), which also may be used as forensic evidence to exclude potential perpetrators.

Knowing the longitudinal prevalence of bitemark cases in country-specific scenarios may contribute to approach violence more properly and mainly alert the scientific community on the need for proper education in forensic sciences - especially in Forensic Odontology. Based on that, the present research aims to assess the jurisprudence screening lawsuits that involve human bites and bitemarks and extracting case characteristics that could support the current panorama of research and practice of bitemark analysis.

MATERIAL E METHODS

The present research was designed with an observational, longitudinal and retrospective approach.

A systematic search was conducted in the online open access jurisprudence of the Court of Justice of São Paulo, Brazil (http://tjsp.jus.br/). Lawsuits were searched by a single examiner using the keywords: "bite" and "bitemark". The examiner applied the search strategy in December 20th 2015. Time limit was not used as a restriction to filtrate the inception of bitemark cases in the jurisprudence.

The inclusion criteria consisted of lawsuits available open access for analysis in full-text; lawsuits claiming indemnification; lawsuits related to crimes against the persons OR domestic violence OR sexual violence OR physical aggression AND bitemarks. The exclusion criteria consisted of lawsuits out of the civil or criminal jurisprudence; and lawsuits involving non-human bitemarks.

The articles eligible for analysis in the present research were read by a single examiner for data extraction. The data extracted were: 1) the initial year of the lawsuit (inception); 2) the year of Court decision (end, exclusively Courts of First Instance); 3) the year in which the bitemark was inflicted; 4) the motivation leading to the bite; 5) the sex of the perpetrator; 6) the sex of the victim; 7) the anatomic region bitten; 8) the potential sequels; 9) the severity of the injury (between mild, severe and very severe); 10) the legal request for forensic expertise; and 11) the outcome of the forensic expertise. The data extracted underwent descriptive statistics on the prevalence rates of the characteristics of lawsuits involving bitemark cases.

RESULTS

The initial systematic search resulted in 2488 lawsuits. After applying the inclusion and exclusion criteria 1125 lawsuits remained involving "bite" or "bitemarks". An overview of the quantity of data available (reported) and not available (not reported) within the lawsuits are found in Table 1.

The quantity of lawsuits detected in the present research increased annually. Figure 1 shows an overview of the lawsuits detected in the jurisprudence distributed according to their year of inception. The overview ranged between 1997 (n= 13) and 2015 (n=202).

All the lawsuits (n=1125) were founded in the criminal scenario. The motivations that led to the bite were grouped in 5 categories (classified according to the Brazilian Penal Code): crime against public administration (e.g. the perpetrator resisted when arrested); crime against the patrimony (e.g. theft); crime against the sexual dignity (e.g. rape and sexual assault); crime against the person – domestic violence (e.g. violence in familiar environment); crime against the person – other (e.g. homicide, bodily injury, torture, kidnapping, robbery followed by death). Table 2 reveals that the crime against the person – domestic violence figures as the most prevalent motivation (modality of crime) with 316 lawsuits (28.1%). More specific, Figure 2 shows that perpetrators were males in 889 lawsuits (79%), while the victims were females in 562 cases (50%).

Table 3 shows the anatomic regions bitten more frequently were the upper limbs (n=362, 32.2%), followed by the head and face (n=183, 16.3%). In 282 (25.1%) lawsuits this information was not reported.

Table 1 – Quantification of the data extracted in the present research distributed as reported and not reported in the lawsuits.

Data	Reported	Not reported
1) The initial year of the lawsuit	1125	0
2) The year of Court decision	1125	0
3) The year in which the bitemark was inflicted	598	527
4) The motivation leading to the bite	1125	0
5) The sex of the perpetrator	1099	29
6) The sex of the victim	1091	34
7) The anatomic region bitten	843	282
8) The potential sequels	1125	0
9) The severity of the injury	1125	0
10) The legal request for forensic expertise	641	484
11) The outcome of the forensic expertise	641	484

Eleven data points extracted from the 1125 lawsuits eligible detected within the systematic search in the Court of justice of São Paulo Brazil.

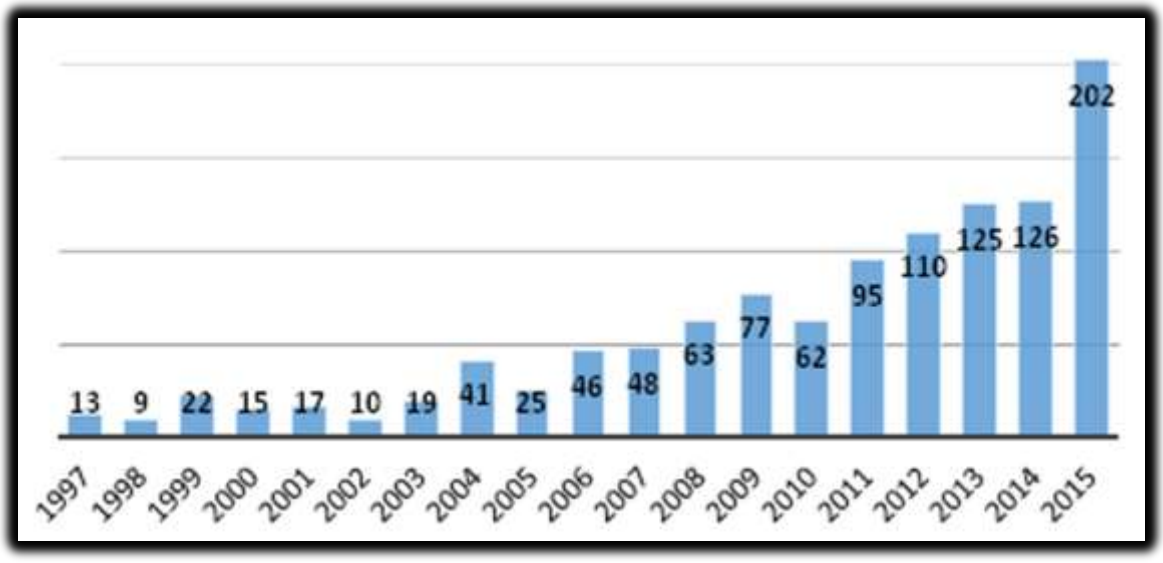

Figure 1 – Distribution of lawsuits detected in the present research based on their year of inception. *Caption: Lawsuits (n=1125) eligible detected within the systematic search in Court of Justice of São Paulo, Brazil, between 1997 and 2015.*

Table 2 – Motivations that led to the bite distributed in descending order of prevalence and percentage.

Modality of crime	**n**	**%**
Crime against the person – domestic violence[a]	316	28.1
Crime against sexual dignity[b]	283	25.2
Crime against the person – other[c]	243	21.6
Crime against the patrimony[d]	192	17.1
Crime against public administration[e]	91	8.1

The motivations were grouped in 5 categories based on the modality of crime. [a]: e.g. physical violence in a familiar environment; [b]: e.g. rape and sexual assault; [c]: homicide, bodily injury, torture, kidnapping, robbery followed by death; [d]: theft; [e]: the perpetrator resisted when arrested; n: quantity of lawsuits; %: percentage.

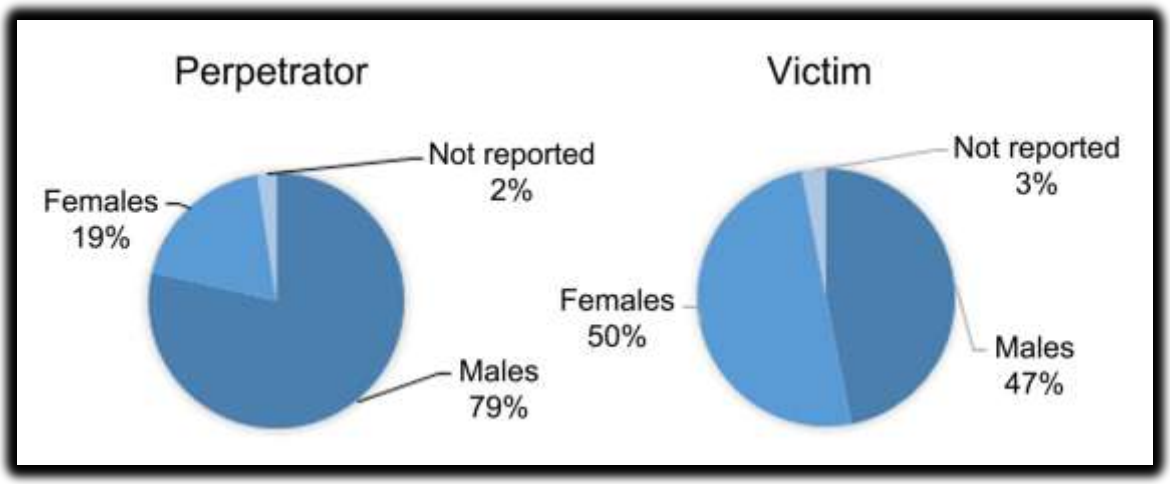

Figure 2 – Distribution of sex information of the perpetrators and victims involved in the lawsuits screened. *Caption: Percentage rates of sex information reported (for males and females) and not reported in the lawsuits (n=1125) eligible detected within the systematic search in Court of Justice of São Paulo, Brazil.*

Table 3 – Anatomic regions bitten distributed in descending order of prevalence and percentage.

Anatomic region bitten	**n**	**%**
Upper limbs	362	32.2
Head and face	183	16.3
Trunk	132	11.7
Several regions	89	7.9
Neck	37	3.3
Lower limbs	22	2.0
Genitals	18	1.6
Not reported	282	25.1

n: quantity of lawsuits; %: percentage.

During the forensic expertise the severity of the bite injury was typified in mild (no permanent impairment), severe (permanent functional debility) and very severe (permanent aesthetic deformity) according to the Brazilian Penal Code. Mild injuries were found in 1039 (92%) lawsuits, while severe and very severe injuries were found in 10 (1%) and 76 (7%) cases, respectively.

The sequels reported from bite injuries are reported in Table 4. In most of the lawsuits (n=1041, 92.5%) the victims had no sequels. Among the victims with sequels, permanent deformities (severe injuries) – specifically ear amputation, figured as the most prevalent (n=50, 4.4%). Only in a single lawsuit (0.1%) death resulted from a bite – specifically due to the rupture of a child's renal capsule.

Medical forensic expertises were performed in the bite injuries in 641 lawsuits (57%). Only in 3 cases (0.26%), bitemark analysis was performed to indicate whether or not suspects could be excluded from a case.

Table 4 – Sequels of bite injuries detected in the lawsuits distributed in descending order of prevalence and percentage.

Sequel	n	%
None	1041	92.5
Partial ear amputation[a]	50	4.4
Lesions of hand and fingers[a]	22	2.0
Other[a]	9	0.8
Permanent functional impairment	1	0.1
Death	1	0.1
Himenal rupture	1	0.1

[a]: permanent aesthetic deformation; n: quantity of lawsuits; %: percentage.

DISCUSSION

Knowing the prevalence and characteristics of cases involving bitemarks in Court is essential to understand how these lesions take place among the physical injuries in the jurisprudence and how the dentist may play a part under the needs of justice. To assess the prevalence and characterize the lawsuits (Table 1), the present study was designed as a systematic search of the jurisprudence conducted longitudinally and purposely in the Court of Justice of São Paulo, Brazil. This Court of Justice was selected strategically because it covers legally the most populous state of Brazil, with nearly 44.7 million habitants – accounting 316 judicial districts. Consequently, the Court of Justice of São Paulo has more lawsuits registered in comparison to the other Courts in the country.

The systematic search in a single Court reached 1125 lawsuits involving human bite injuries registered between 1997 and 2015. The impressive amount of lawsuits revealed a gradual annual increase, starting with 13 cases in 1997 progressing to 202 cases in 2015 (Figure 1). This

phenomenon may be justified bilaterally. Firstly, because bite injuries follow the increasing crime rates and physical violence observed globally[2]. Secondly, because this type of injury is associated with sexual violence[10] and is usually underreported[15]. Underreported crimes represent a social problem that may impact on public safety. Strategies against the underreported sexual violence arose in the last decade[16] potentially increasing the quantity of lawsuits in the jurisprudence (Figure 1). Accordingly, the false (positive) impression that bite injuries became more prevalent worldwide is given, while in fact it occurs chronically. Apart these justifications, the implementation of online judicial systems appear as an additional factor to explain the increased lawsuits in the last few years. Specifically, it is founded on the fact that these systems became available only recently, hampering the documentation of lawsuits from the past.

To our knowledge, the only similar survey that investigated the prevalence and characteristics of lawsuits involving bite injuries in the jurisprudence was performed by Negre and Gil[17], 2012. The authors detected 16 cases involving human bitemarks registered between 2004 and 2011 in the local Court of Castellón[17], Spain. In the same period, the Court of São Paulo registered 457 cases (Figure 1). While the population size in São Paulo is nearly 256 times bigger than Castellón, the bite injury is 28 times more prevalent. In both populations these injuries played a part in Court and raised the scientific interest for the characterization of the related jurisprudence.

After characterizing the chronological aspects related to the jurisprudence involving bite injuries, the present research aimed to investigate the motivation behind the injury. The most prevalent motivation was typified in the criminal scenario the as crime against the person (domestic violence) (28.1%), followed close by crime against sexual dignity (25.2%) and other crimes against the person (21.6%) that included homicide, bodily injury, torture, kidnapping and robbery. The scientific literature corroborates these findings indicating that crimes involving bite injuries are usually homicide, rape, sexual assault, robbery and intimate partner and child abuse[18]. Differently, sexual assault and child abuse did not figure among the motivations found in the study of Negre and Gil[17]. Mostly, the motivations found by the authors consisted of mutual aggressions due to physical struggle[17]. The literature also confirms the high prevalence of bite injuries during physical struggle[19], but it trends to become a more prevalent motivation if associated with criminal sexual intentions[20]. Based on that, the motivations reported by the study of Negre and Gil[17] could confirm the present study. However, no further details were provided to indicate whether or not the bite injuries were committed in a domestic environment and with sexual violence.

Considering that most of the crimes involving bite injuries are committed in the domestic environment and may involve especially sexual violence, a large discrepancy between the sex of the perpetrator and the victim was expected. The present survey demonstrated that perpetrators were mainly males (79%) (Figure 2), while the victims were similarly

distributed based on sex. A survey performed in the USA with 1100 forensic dentists, showed that in 259 bitemark cases the perpetrators were mainly males while the victims were mainly females[18,21]. Interestingly, when stratified in age ranges, females played more frequently the role of victim (2.97 times more than males) when aged between 11 and 50 years old[18,21], while no evident predilection for sex is made among younger victims (<11 years old). No similar approach was feasible in the present study considering the data available in the lawsuits. Further studies could be conducted to retrieve this demographic information in order to provide a more detailed sex characterization of the bitten victims.

Considering the previous findings of the present survey, intimate areas were expected among the anatomic regions more commonly bitten, because bite injuries were sexually motivated (25.2%), occurred in a domestic scenario (28.1%), and were inflicted by men in most of the lawsuits (79%). However, the most affected anatomic regions were the upper limbs (32.2%) (Table 3), while intimate areas were not commonly affected (e.g. genitals, 1.6%). Similarly, the literature reported the arms as more often involved in bitemark cases (22.7%)[18,21]. Intimate areas figured more frequently in the top of anatomic regions only when stratified by sex (e.g. breasts, 14%, ranked 3rd anatomic region)[18,21]. A potential justification for the high prevalence of bitten arms relies on the fact that these anatomic regions are considerably exposed during physical struggle, and may be bitten both by the perpetrator (attacking) and the victim (defending) under violent situations.

Once registered on human skin, the bite injury may be assessed by a forensic expert and typified to support the Court on the quantification of potential impairment and sequels. In specific, injuries were typified based on the national Penal Code that considers (among other aspects) as mild the injuries that do not influence significantly the physical integrity of a person (with no permanent injury); severe: injuries that hampers completely the daily activities of the victims for more than 30 days (permanent functional impairment); and very severe: injuries that cause permanent deformation and incapacitation for work (permanent aesthetic impairment)[22]. Most of the injuries analyzed in the lawsuits were classified as “mild” (92%) in a severity scale. Possibly, for that reason most of the victims did not reveal sequels when examined (92.5%). Among the victims with permanent deformations, partial ear amputation was observed more frequently (4.4%). This type of lesion was also reported previously in the scientific literature[17] – especially leading to aesthetic sequels. From a legal scope, this finding has an important meaning considering that the jurisprudence currently undergo a new trend of lawsuits founded on claims of aesthetic impairments.

It is important to note that, forensic experts not only contribute in Court with the assessment and quantification of aesthetic and functional impairment and sequels, but also may indicate whether or not suspects may be linked to a crime by their dental traits. This procedure is based on the 2D[23] or 3D[24,25] comparison between forensic evidences found in the bite patterned injury and the dental traits of the suspects. In the

present study, forensic expertise was requested by the Court in 641 (57%) lawsuits. However, only 3 (0.26%) expertises aimed to provide technical and scientific information in the potential involvement of suspects in the crime. Initially, these outcomes may suggest that few dental expertises are requested in Court. However, attention must be given to the whole scenario, in which nearly half of the lawsuits were supported with forensic expertises (not necessarily to point out potential perpetrators). The number of expertises related to the identity of the perpetrator in the context of bitemark analysis may be reduced significantly with the confession and testimony of suspects. Dentists (as expert witnesses) must be trained and updated to attend properly the needs of justice in any area of Forensic Odontology. Programs in Forensic Odontology must promote bitemark education both for the quantification of the impairment and sequels and well for the investigation of the injury as a patterned mark.

CONCLUSIONS

The present survey brings important information to the legal demographics related to bite and bitemark injuries. Further studies should be conducted in Courts of different countries and states to increase the panorama and enable a comparison with the present findings. Despite the limitation of investigating a single Court, the present study reached a large sample size. Further studies should be conducted in order to retrieve more demographic information from the Courts, such as the age of victims and perpetrators as well the Court decision and penalty given to the crimes involving bites and bitemarks.

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RESUMO

Introdução: Ao longo dos anos a violência física vem se tornando um grande problema global que tem mostrado seu reflexo no aumento do número de jurisprudências envolvendo o assunto. Em alguns casos o agressor e a vítima podem produzir o mesmo padrão de injúria física, como a marca de mordida. Sabendo que as marcas de mordida e mordeduras humanas podem estar presentes em casos que envolvam ações judiciais é muito importante entender e incentivar a atuação do perito odontolegista para análise das marcas de mordida em processos judiciais. Objetivo: Analisar acórdãos que estivessem relacionados às marcas de mordidas e que pudessem subsidiar a rotina de marcas de mordida e a prática de análise dessas marcas. Materiais e métodos: Foi realizada uma busca sistematizada de acórdãos no Tribunal de Justiça de São Paulo utilizando as seguintes palavras-chave: mordida, dentada e mordedura. Apenas os acórdãos que estavam disponíveis em inteiro teor foram avaliados para captação dos dados que foram tabulados em uma planilha própria da pesquisa. Resultados: Foram detectados 2488 acórdãos, dos quais 1125 foram compatíveis com os critérios de elegibilidade, e datados entre os anos de 1997 a 2015. A análise pericial foi realizada em 641 (56,97%) casos, sendo o agressor identificado pela mordida em apenas 3 (0,26%) casos. Conclusão: Houve um significativo aumento em processos judiciais envolvendo marcas de mordida. Os odontolegistas devem estar cientes da ocorrência das marcas de mordida no cenário das agressões físicas bem como as limitações inerentes à análise dessas marcas frente ao campo de atuação dos peritos odontolegistas. O presente estudo fornece evidências para incentivar o aumento do estudo da análise das marcas de mordida.

PALAVRAS-CHAVE

Odontologia legal; Mordeduras humanas; Jurisprudência; Legislação e jurisprudência.

REFERENCES

1. World Health Organization. Violence. Available at: http://who.int/topics/violence/en; 2014. Accessed 14th of February 2017.
2. Dahlberg LL, Krug EG. Violence: a global public health problem. Cienc Saude Col. 2006; 11(2): 1163-78. http://dx.doi.org/10.1590/S1413-81232006000200007
3. Mohamadian F, Hashemian A, Bagheri M, Direkvand-Moghadam A. Prevalence and risk factors of domestic violence against Iranian women: a cross section study. Korean J Fam Med. 2016; 37(4): 253-8. http://dx.doi.org/10.4082/kjfm.2016.37.4.253
4. Silva LEL, Oliveira MLC. Epidemiological characteristics of violence against women in the Federal District, Brazil, 2009-2012. Epidemiol Serv Saude. 2016; 25(2): 331-42. http://dx.doi.org/10.5123/s1679-49742016000200012
5. Rodrigues JL, Lima PA, Nagata JY, Rigo L, Cericato GO, Franco A *et al.* Domestic violence against children detected and managed in the routine of dentistry – a systematic review. J Forensic Leg Med. 2016; 43: 34-41. http://dx.doi.org/10.1016/j.jflm.2016.07.006
6. Silva LO, Souza-Silva BN, Rodrigues JLA, Rigo L, Cericato GO, Franco A *et al.* Identification and management of elder physical abuse in the routine of dentistry – a systematic review. Gerodontol. 2017; 34(1): 3-12. http://dx.doi.org/10.1111/ger.12252.
7. Franco A, Willems G, Souza PHC, Coucke W, Thevissen P. Uniqueness of the anterior dentition three-dimensionally assessed for forensic bitemark analysis. J Forensic Leg Med. 2017; 46: 58-65. http://dx.doi.org/10.1016/j.jflm.2017.01.005
8. Maistry S, Phillips VM. Forensic dentistry case book 6: a self-inflicted bite mark: a case report. S Afr Dent J. 2016; 71(2): 76-77.
9. Singh SP, Aggarwal A, Kaur S, Singh D. Self inflicted human teeth bites: a case report. Pan Afr Med J. 2014; 19: 353. http://dx.doi.org/10.11604/pamj.2014.19.353.4561
10. Senn DR, Weems RA. Manual of forensic odontology. 5th ed. Boca Raton: CRC Press; 2013.
11. Miranda-Rius J, Brunet-Llobet L, Lahor-Soler E, Mendieta C. An unexpected presentation of a traumatic wound on the lower lip: a case report. J Med Case Rep. 2014; 8: 298. http://dx.doi.org/10.1186/1752-1947-8-298
12. Martin-Fumadó C, Martínez-Zamora MA, Capella ET, Martínez-Román S, Castro AMT, Carmona F. Genital mutilation bite in gender-based violence. Rev Esp Med Legal. 2015; 41(1): 36-9. http://dx.doi.org/10.1016/j.reml.2014.08.002
13. Bastuq A, Kislak S, Mutlu NM, Akcaboy ZN, Koksal A, Sertcelik A, *et al*. Necrotizing fasciitis due to Streptococcus mitis caused by accidental human bite. J Infect Dev Ctries. 2016; 10(1): 100-2. http://dx.di.org/10.3855/jidc.7040
14. Dorion RBJ. Bitemark evidence: a color atlas and text. 2nd ed. Boca Raton: CRC Press; 2011.
15. Guruge S, Jayasuriya-Illesinghe E, Gunawardena N, Perera J. Intimate partner violence in Sri Lanka: a scoping review. Ceylon Med J. 2015; 60(4): 133-8. http://dx.doi.org/10.4038/cmj.v60i4.8100
16. Black MC, Basile KC, Breiding MJ, Smith SG, Walters ML, Merrick MT *et al*. The national intimate partner and sexual violence survey (NISVS): 2010 summary report. Atlanta: National Center for Injury Prevention and Control & Centers for Disease Control and Prevention; 2010.
17. Negre MC, Gil P. Valuation of the corporal damage by bites: decisions of the Audiencia Provincial de Castellón. Gac Int Sci Forense. 2012; 4: 43-57.
18. Herschaft EE, Alder ME, Ord DK, Rawson RD, Smith ES. Manual of forensic odontology. 4th ed. Boca Raton: CRC Press; 2006.
19. Santos TS, Antunes AA, Carvalho RWF, Avelar RL, Melo REVA, Dourado E. Profile of patients presenting facial bite wounds: a retrospective study. Rev Gauc Odontol. 2007; 55(4): 369-73.
20. Reis CEF, Sá MES. Complications from human bites: teeth as lethal weapons. Rev Univ Val Rio Verde. 2013; 11(1): 156-66. http://dx.doi.org/http://dx.doi.org/10.5892/ruvrv.2013.111.15616
21. Freeman AJ, Senn DR, Arendt DM. Seven hundred seventy eight bite marks: analysis by anatomic location, victim and biter demographics, type of crime, and legal disposition. J Forensic Sci. 2005; 50(6): 1436-43. http://dx.doi.org/https://doi.org/10.1520/JFS2005178
22. Garbin CAS, Garbin AJI, Dossi AP, Dossi MO. Domestic violence: an analysis of injuries in female victims. Cad Saude Pub. 2006; 22(12): 2567-73. http://dx.doi.org/http://dx.doi.org/10.1590/S0102-311X2006001200007
23. Johansen RJ, Bowers CM. Digital analysis of bite mark evidence using Adobe Photoshop. Santa Barbara: Forensic Imaging Services; 2000.

24. Naether S, Buck U, Campana L, Breitbeck R, Thali M. The examination and identification of bite marks in foods using 3D scanning and 3D comparison methods. Int J Legal Med. 2012; 126(1): 89-95. http://dx.doi.org/10.1007/s00414-011-0580-7

25. Thali MJ, Braun M, Markwalder TH, Brueschweiler W, Zollinger U, Malik NJ *et al*. Bite mark documentation and analysis: the forensic 3D/CAD support photogrammetry approach. Forensic Sci Int. 2003; 135(2): 115-21. http://dx.doi.org/10.1016/S0379-0738(03)00205-6