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Aggressive driving behavior: road rage incidents in Athens from the clinical forensic point of view

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Abstract

Background Aggressive driving behavior may lead to interpersonal violence. The Athens Metropolitan area has over four million inhabitants. Public transportation has improved over the last decades, mainly due to the work performed before the 2004 Olympic Games but is still lacking in the coverage of the Attica region with fixed track transportation. Thus, traffic in Athens is usually heavy during the day, a fact that combined with limited parking spaces available, acts as fuel to aggressive driving behaviors.

For this retrospective study, data from forensic clinical examinations performed at our department by the authors were reviewed. More specifically, cases examined from January 1st, 2012, to September 30rd, 2021, all concerning allegations for road rage were included, totally 177 cases. The data obtained was analyzed by utilizing SPSS Statistics.

Results Most victims and perpetrators were drivers of their vehicles. In most cases (85.3%), perpetrators acted alone. 80.2% of victims reported that the incident was triggered by a minor conflict. Perpetrators used mostly just their hands and feet, or even their head as a blunt force instrument to inflict injuries (72.3%). Hammers, crowbars, and brass knuckles were used in 12.4% of cases, while in 9.6% the vehicle was used to overrun the victim. In 2.8% of cases, perpetrators attempted to strangulate the victims, while in 1.7% they used a sharp force instrument. In 9.6% of cases, victims did not sustain any visible external injury. 18.1% of victims sustained just a single injury, while in 72.3% multiple injuries were observed. 69.5% victims sustained merely external injuries, while in 20.2% at least one internal organ injury was sustained. The predominant injury site was by far the head-neck region. In more than one third of the road rage incidents, the injuries could be characterized as grievous.

Conclusions Most people involved were male motorists. Females are rarely victims of road traffic violence, and even more rarely act as perpetrators. Commonest injury site was the head-neck region, with second commonest the upper extremities.

Keywords Clinical forensic medicine, Road rage, Injuries

Background

Aggressive driving behaviors may lead to interpersonal violence. The Athens Metropolitan area has over four million inhabitants. Means of public transportation have improved over the last decades, mainly due to the work performed before the 2004 Olympic Games (Attiki_Odos 2024; Elliniko_Metro 2024), but nevertheless are still

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insufficient, with respect to fixed-track transportation (e.g., subway) coverage of the Attica region (Elliniko_Metro 2024). Thus, traffic in Athens is usually heavy during the day (Lialios 2022), a fact that combined with limited parking spaces available, acts as fuel to aggressive driving behaviors. Naturally, cultural attitudes toward vehicles, driving, and public space might influence and exacerbate such behaviors.

Many incidents of interpersonal violence have thus been recorded over the last years, all with one common factor, aggressive driving behaviors. Nevertheless, this does not represent exclusively a Greek phenomenon, as it has been described all over the world. The documentation of relevant injuries falls within the scope of clinical forensic medicine.

Road rage is best described as various aggressive behaviors involving motorists and sometimes pedestrians, which range from shouting to using firearms or even one's vehicle to inflict damage. Common characteristic of all these behaviors is that they exceed the "initial" offense, as perceived by the perpetrator (Sansone and Sansone 2010). Naturally, different regions' unique socioeconomic, cultural, and urban planning contexts can significantly influence the nature and frequency of road rage incident, but unfortunately relevant literature is not extensive for every part of the world.

Literature descriptions of road rage widely vary and include various definitions. Some describe road rage as an "*uncontrolled aggressive behavior*" of a driver (Fong et al. 2001), or a "*range of aggressive and dangerous driving behaviors*" toward other motorists (Lupton 2002) or even dangerous behaviors that "*are accompanied by intentional acts of aggression toward others, negative emotions while driving, and risk-taking*" (Dula and Geller 2003). Additionally, road rage has even been considered as a "*bona fide psychological disorder*" (Ayar 2006).

All these behaviors causatively contribute to some road traffic accidents (RTA) which may have lethal outcome (Mann et al. 2007). Therefore, the above-mentioned burden imposed on RTA by road rage subsequently requires an in-depth assessment (including etiological factors involved), to detect any possible way of counteraction. It should be, nevertheless, noted that road rage incidents may occur even after minor traffic incidents, or even after merely verbal disputes between motorists, without any vehicle collision.

Further assessment of the road rage phenomenon is additionally required because interpersonal violence involving motorists may often result in grievous injuries. According to the literature, the usual road rage perpetrator is a young male motorcyclist (Sansone and Sansone 2010). Literature suggests that sometimes the perpetrators may become victims in different cases, possibly due to their tendency to get involved in a quarrel. Psychological factors, like excess stress and anger-management issues, along with purely psychiatric conditions seem to largely trigger road rage. Furthermore, alcohol and illicit substances seem to account for a significant portion of these incidents (Fierro et al. 2011).

Most of these incidents seem to occur during afternoon and evening hours, usually following a dispute over traffic-related issues. Finally, studies propose that victims suffer mostly from blunt force injuries on the head and on the extremities. Outpatient hospital care is usually sufficient, as life threating situations are quite rare. Most severe injuries reported are facial fractures, eyeball penetration, tympanic rupture, spinal distortion, and extremities' sprains (Fong et al. 2001; Sansone and Sansone 2010; Pfeiffer et al. 2016; Burnett 2018).

To the best of our knowledge, as the road rage phenomenon represents an uncharted area, no similar study has been performed in Greece, so far. The aim of the current study is to aid in the profiling of both perpetrators and victims, to better relay information to the public regarding its usual behavior during these incidents, and to gain knowledge on possible involvement avoidance in these cases. This article aims to clarify specific characteristics of individuals involved (e.g., age, sex), means of transportation (e.g., car driver, motorcycle driver, pedestrian), peak of occurrence over the time (daily, weekly, monthly distribution), and finally, location and severity of injuries sustained.

From the forensic point of view, road rage incidents represent a distinct form of community violence, not yet thoroughly investigated, that may lead to sometimes significant morbidity.

Methods

Sample

For this retrospective study, data from forensic clinical examinations performed at the Department of Forensic Medicine and Toxicology (DFMT) of the School of Medicine of the National and Kapodistrian University of Athens, Greece, by the authors were reviewed. More specifically, cases examined from January 1st, 2012, to September 30rd, 2021, all concerning allegations for road rage, totally 177 case records, were included.

It should be noted that in Greece for an individual to be examined by a forensic pathologist, an official allegation must have been priorly filed to the authorities. Naturally all cases examined concern claims for physical injuries.

For every case, the following variables were recorded:

- Victims' and perpetrators' demographic characteristics (sex, age group, nationality, employment status). Perpetrators' age was obtained either through license

plate identification by the police, or by report given by the victim (by approximation).
- Victims' and perpetrators' status during the incident (e.g., vehicle driver and motorcyclist).
- Total number of perpetrators in each incident.
- Date of the violent incident (hour, day, month).
- Cause of the violent incident.
- Estimation of incapacitation, due to injuries, estimated in days.
- Injury mechanism.
- Primary care received before the forensic examination.
- Number of injuries (none/one/multiple).
- Type of injuries (external injuries/internal injuries).
- Body region affected (head-neck, torso, upper and lower extremities).
- Injury characterization according to the Greek Penal Code (grievous injuries and actual injuries).

Assessment of injury severity (including estimation of incapacitation days) was based on the Greek Penal Code and represents an approximative description of the period during which the individual cannot properly have full use of its own body (e.g., all bone fractures were characterized as grievous injuries and relevant incapacitation days were based on treatment time required).

All data were collected anonymously. Ethics approval was obtained by the Committee on Bioethics and Deontology of the Medical School of the National and Kapodistrian University of Athens (number 827–27/11/2023).

More specifically, we extracted data from the Forensic Information System, currently in operation in DFMT, employing the protocol number as identifier and omitting other details (e.g., name, surname). Data was extracted in MS-Excel format and then entered to SPSS Statistics. All parameters extracted are cited in detail above.

According to the Greek Penal Code, an actual injury refers to a minor physical injury (other than totally insignificant ones) that usually requires minor treatment and a grievous injury is a serious physical injury that usually either requires hospitalization or major treatment. A grievous injury, according to the Greek Penal Code, as a result inhibits "use of a persons' own body for a prolonged period of time" (Republic 2019).

Statistical analysis

The data obtained was analyzed by utilizing SPSS Statistics (IBM SPSS Statistics for Windows, version 26.0. Armonk, NY: IBM Corp). To determine whether there is a relationship between the categorical variables of the present study, we performed chi-squared (χ^2) tests for independence with a significance level of $p \leq 0.05$. Nevertheless, chi-squared test tends to be more accurate with larger sample sizes and an assumption of the expected frequency in more than 20% of cells to be more than five has to be met. As an alternative, Fisher's exact tests were employed after creating 2×2 contingency tables (2 rows and 2 columns). Fisher's exact test is also a statistical test used to determine if there are nonrandom associations between two categorical variables. It is typically used when sample sizes are small, and it calculates the exact probability of observing the data given the null hypothesis of no association between the variables. For all associations presented, the degrees of freedom (df) are equal to one (Fisher 1922; Agresti 2022).

Wherever data was not available, relevant records were excluded from the specific statistical analysis. During data collection, more specifically during the phase of qualitative assessment of injuries, all relevant data were reviewed by two of the authors to ensure data entry reliability.

Results

During the above specified period, 177 relevant cases were identified. Victims' and perpetrators' demographic characteristics are presented in Table 1.

Most victims and perpetrators were drivers of their vehicles (Table 2).

In most cases ($N=151$, 85.3%), perpetrators acted alone (only 17 cases—9.6%—involved two perpetrators and 9 cases—5.1%—involved three to five perpetrators). More than one third of the cases (72 cases, 40.7%) fall within the scope of youth violence, as either victims or perpetrators were of age under 30 years (W.H.O., 2023).

In most cases ($N=142$, 80.2%), victims reported that the incident was triggered by a minor conflict, most commonly over a parking slot, littering, or misunderstanding during driving maneuvers (e.g., overtaking), not justified use of the car horn. In 19 cases (11.7%), the assault was triggered by a road traffic accident, and in 14 cases (8.6%) by a violation of the traffic code (e.g., crossing a red light or violation of a stop sign).

Perpetrators used mostly just their hands and feet, or even their head as a blunt force instrument to inflict injuries ($N=128$, 72.3%). Hammers, crowbars, and brass knuckles were used in 22 cases (12.4%), while in 17 cases (9.6%) the vehicle was used to overrun the victim. In 5 cases (2.8%), perpetrators attempted to strangulate the victims, while in 3 cases (1.7%) they used a sharp force instrument. In the remaining 2 cases, the perpetrators either have bitten the victim, or fired blank ammunition with a firearm.

Monthly, daily, and hourly distribution is demonstrated in Figs. 1, 2, and 3, respectively. It appears that 61 incidents (34.5%) took place during weekends or holidays. Approximately half of the victims ($N=93$, 52.5%)

Table 1 Victims' and perpetrators' demographic characteristics

	Victims ($n=177$) *N* (%)	Perpetrators ($n=221$)[a] *N* (%)
Sex		
Male	154 (87.0%)	207 (93.7%)
Female	23 (13.0%)	13 (5.9%)
Unknown	0	1 (0.4%)
Nationality		
Greek	168 (94.9%)	137 (62.0%)
Foreigner	9 (5.1%)	6 (2.7%)
Unknown	0	78 (35.3%)
Employment status		
Employed	128 (72.3%)	46 (20.8%)
Unemployed	32 (18.1%)	8 (3.6%)
Retired	16 (9.0%)	4 (1.8%)
Unknown	1 (0.6%)	163 (73.8%)
Age		
≤ 17	0	1 (0.4%)
18–29	35 (19.8%)	53 (24.0%)
30–39	39 (22.0%)	47 (21.3%)
40–49	47 (26.6%)	41 (18.6%)
50–59	33 (18.6%)	20 (9.0%)
60–69	16 (9.0%)	11 (5.0%)
≥ 70	7 (4.0%)	4 (1.8%)
Unknown	0	44 (19.9%)
Mean age (SD)	43.46 (14.09)	40.99 (16.21)
Median age	43	38

[a] In 26 cases, the victim was assaulted by multiple perpetrators

Table 2 Victims' and perpetrators' status during the incident

	Victims ($n=177$) *N* (%)	Perpetrators ($n=221$)[a] *N* (%)
Car driver	111 (62.7%)	118 (53.4%)
Motorcyclist or bicyclist	11 (6.2%)	19 (8.6%)
Public transport driver (taxi or bus driver)	11 (6.2%)	9 (4.1%)
Pedestrian	14 (7.9%)	14 (6.3%)
Car passenger	8 (4.5%)	14 (6.3%)
Unknown	22 (12.5%)	47 (21.3%)

[a] In 26 cases, the victim was assaulted by multiple perpetrators

attended a hospital for primary care, and only a few ($N=5$, 2.8%) required hospitalization.

In 17 cases (9.6%), victims did not sustain any visible external injury. Thirty-two victims (18.1%) sustained just a single injury, while in most cases ($N=128$, 72.3%) multiple injuries were observed. One hundred twenty-three victims (69.5%) sustained merely external injuries, while in 37 cases (20.2%) at least one internal organ injury was sustained (Table 3).

The predominant injury site was by far the head-neck region (Table 4). Furthermore, as shown in Table 4, in more than one third (38.4%) of the road rage incidents, the sustained injuries could be characterized as grievous injuries.

Upper limbs injuries, and especially arm injuries, were sustained more frequently during working days, when compared to holidays, while forearm injuries were less frequent in youth violence incidents, when compared to non-youth violence injuries (Table 5).

Discussion

A recent study which involved a large sample across Europe suggested that car drivers in Greece are probably the most prone, among Europeans, to verbally insult and tailgate other drivers. Nevertheless, the incidence of road rage cases in Greece (including those involving physical violence) does not deviate from the described European levels (Lama 2021).

To the best of our knowledge, this is the first Greek study that addresses the "road rage" phenomenon, and the second that focuses on injuries inflicted during these incidents.

Most people involved in road rage incidents (both victims and perpetrators) were motorists (Pfeiffer et al. 2016), while the other road users, such as bicyclists and pedestrians, represent a much smaller subgroup. This is probably best explained by the mere quantity of private vehicles in circulation worldwide, as it is compatible with increased probability of violent incidents involving vehicle occupants, purely from a statistical point of view. Furthermore, taking under consideration that our jurisdiction area comprises mainly of densely populated areas, increased incidence of traffic and parking issues is to be expected.

By examining the demographic characteristics of both victims and perpetrators, the results present several interesting data. Firstly, both are predominately male. Females appear to be rarely victims of road traffic violence, and even more rarely act as perpetrators. This finding is in accordance with the findings of many international studies, as men appear to be largely more prone to violent incidents, including road rage violence (Mizell et al. 1997; Pfeiffer et al. 2016).

Mean victim age was 43.46 years, while the mean perpetrator age was 40.99 years. Evidently, people of younger age are mostly involved in road rage, a finding consistent with other studies (Fong et al. 2001; Sansone and Sansone 2010; Rodrigo, et al. 2015). However, according to our results, victims tend to be of slighter older age, while on the contrary perpetrators of slightly younger age (Pfeiffer

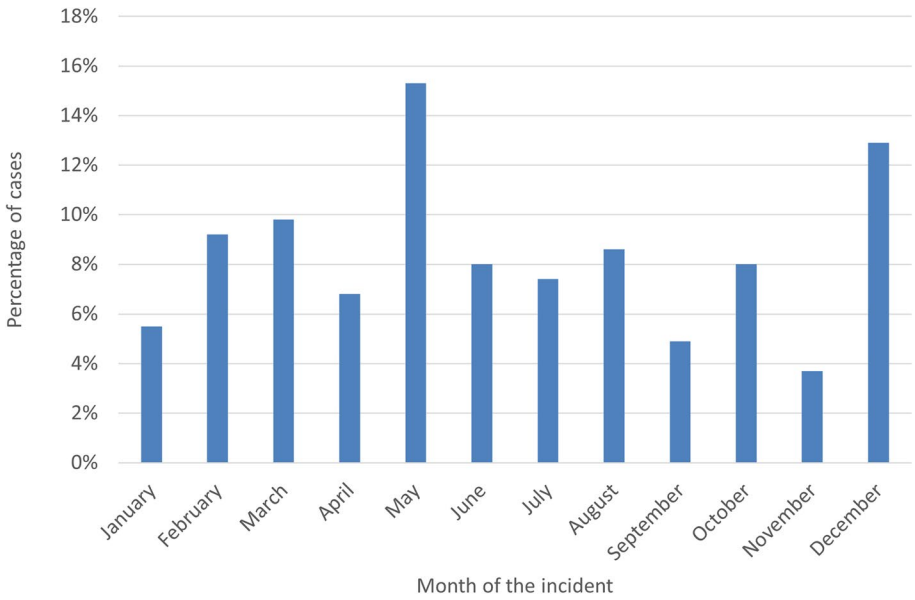

Fig. 1 Bar chart showing monthly distribution of road rage-related allegations

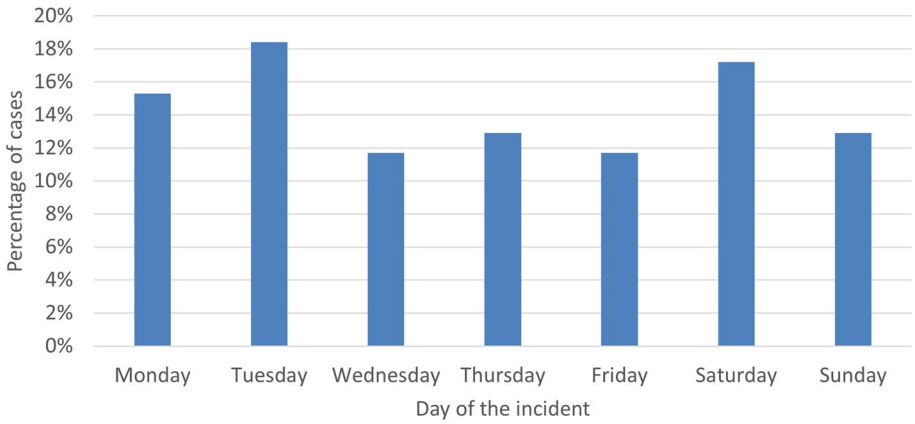

Fig. 2 Bar chart showing daily distribution of road rage-related allegations

et al. 2016). This can be perhaps attributed to the mentality of younger people, who may often overreact and become audacious under difficult conditions.

The nationality of both victims and perpetrators in our sample is mostly Greek, which reflects the composition of the local population. Lack of data concerning the employment status of a large perpetrator proportion is to be expected, as they quite often remain unidentified having fled the scene.

A similar study to ours, which included forensic cases of road rage in Germany, was published a few years ago (Pfeiffer et al. 2016). It should be noted that data from Germany and Greece do not represent broader European or global patterns, as potential cultural, legal, or socioeconomic differences may exist. Nevertheless, both studies (Germany and Greece) address the issue in hand in similar manner and thus are comparable.

In both studies, the commonest injury site was the head-neck region, with second commonest the upper extremities, probably as most victims were car drivers and were assaulted while still being inside their car. Furthermore, the increased head and neck injuries incidence may provide adequate explanation for the increased number skull fractures observed. According to a study performed in our department, concerning interpersonal violence (Katsos 2019), head injuries are more common during robberies, sport-related violence, and road rage incidents.

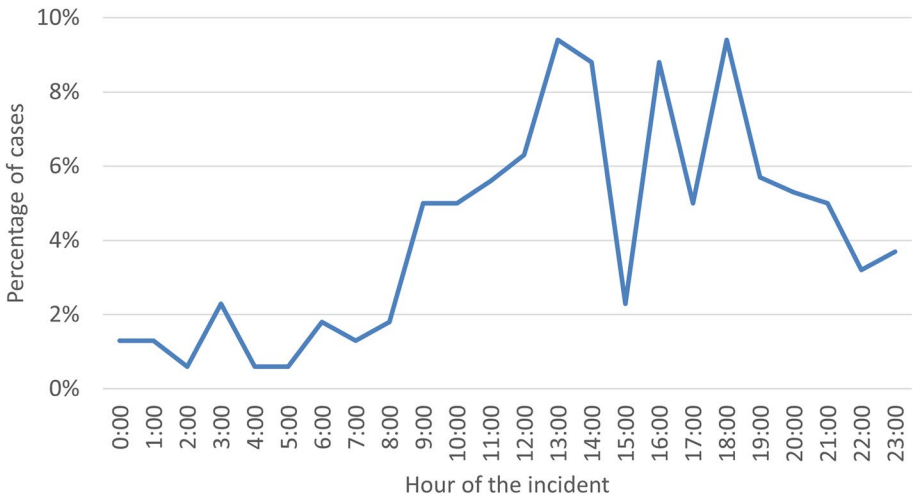

Fig. 3 Line graph showing hourly distribution of road rage-related allegations

Table 3 Internal injuries sustained to victims ($n=37$)

Internal injuries	*N*
Eye injuries (e.g., subconjunctival hemorrhage and cornel abrasions)	10
Nasal bone fracture	10
Eye socket fracture	5
Tooth fracture	3
Ankle fracture	2
Ligamentous injury of the shoulder	2
Mandible fracture	2
Vertebrae fracture	2
Coccyx fracture	1
Frontal bone fracture	1
Meniscus injuries	1
Radius fracture	1
Rib fracture	1
Subdural hemorrhage	1

Table 4 Anatomical distribution of injuries and injury characterization according to the Greek Penal Code[a] (Republic 2019)

Anatomical injury distribution and injury characterization according to the Greek Penal Code	*N* (%)
None	17 (9.6%)
Head-neck	126 (71.2%)
Face	112 (63.3%)
Skull	33 (18.6%)
Neck	21 (11.9%)
Torso	39 (22.0%)
Thorax	17 (9.6%)
Abdomen	6 (3.4%)
Back	22 (12.4%)
Upper extremities	70 (39.5%)
Arms	39 (22.0%)
Forearms	32 (18.1%)
Hands	33 (18.6%)
Lower extremities	41 (23.2%)
Thighs	30 (17.0%)
Leg calves	25 (14.1%)
Feet	6 (3.4%)
Actual injuries	92 (52.0%)
Grievous injuries	68 (38.4%)

[a] According to the Greek Penal Code, an actual injury refers to a minor physical injury and a grievous injury is a serious physical injury

Upper extremities injuries were found to occur more often during working days, when compared to weekends or holidays ($p<0001$). A possible explanation might be that during weekend and holidays, when alcohol consumption is thought to be increased, the ability of victims to either defend themselves or attack the perpetrators would be consequently impaired. It should be noted that upper extremities injuries were by far more common at the German study (62.9%), when compared to ours (39.5%).

Other interesting sites of injuries are those on the neck and the back. The former may be indicative of a strangulation attempt, while the latter may imply that either the victim was attacked from behind, or that he/she fell upon a rough and unyielding surface, outside the car. Injuries to these sites were more common in our study (11.9% and 12.4%, respectively), compared to the German study (4.3% and 5.2%, respectively).

Based on our results, which are in accordance with the German study, most of the perpetrators employ body

Table 5 Selected results from statistical analysis

	Youth violence[a]	Non-youth violence	*p* value
No injuries	8.3%	10.5%	0.517
At least internal injuries	25.0%	18.1%	0.517
At least face injuries	68.1%	60.0%	0.341
At least lower limb injuries	27.8%	20.0%	0.277
At least forearm injuries	11.1%	22.9%	**0.048**
Injuries could be legally characterized as grievous	44.4%	34.3%	0.583
	Working days	Holidays	*p* value
At least face injuries	60.3%	68.9%	0.264
At least upper limb injuries	48.3%	22.9%	**0.001**
At least arm injuries	28.4%	9.8%	**0.005**
Injuries could be legally characterized as grievous	36.2%	42.6%	0.675
	Lone perpetrator	Multiple perpetrators	*p* value
At least face injuries	60.9%	76.9%	0.118
At least neck injuries	10.6%	19.2%	0.203
At least back injuries	10.6%	23.1%	0.075
At least hand injuries	20.5%	7.7%	0.121
At least lower limbs injuries	16.7%	61.5%	0.991
At least internal injuries	19.2%	30.8%	0.114
Injuries could be legally characterized as grievous	36.4%	50.0%	0.134

[a] Youth violence concerns cases in which either victims or perpetrators were of age under 30 years

parts as blunt force instruments (e.g., hands and feet) to assault the victims. This fact suggests that probably perpetrators act impulsively and spontaneously during the quarrel. Apparently, perpetrators employ other instruments (e.g., knives and guns) to inflict more severe injuries, only in extremely rare cases. Nevertheless, it should be noted that even a headbutt or a punch to the face may cause grievous injuries (e.g., fractures of the nasal bone, of the eye socket, or even of the teeth). It should be noted that firearm possession is illegal in Greece, apart from very few "special" cases, therefore, armed offense road rage incidents remain consequently at very low levels. A recent study from our department concerning non-fatal interpersonal violence revealed an extremely low rate on gun-related injuries in clinical forensic cases (1.2% in 2466 cases) (Katsos 2019).

The most intriguing fact that deserves further future study and analysis is that in most of these incidents, the perpetrators "unleash" severe aggressiveness toward a not-known-to-them person. Furthermore, in almost 40% of these quarrels between strangers, injuries may be legally characterized as grievous, requiring medical care or hospitalization. These injuries are added to the already increased injury burden due to other, more common, interpersonal violent incidents. Future studies should focus to any possible relation that may exist between road rage perpetration and other, not immediately apparent violent acts, such as domestic violence.

Interestingly, road rage incidents tend to reach a peak in frequency during afternoon hours, as demonstrated in Fig. 3, possibly because of the combination of both increased stress (after the end of the workday) and dense traffic conditions. It is possible that this combination may cause irritability to some drivers that may lead to application of physical violence, should an incident arise.

As demonstrated in Fig. 4, road rage incidents allegations are showing a gradually upward trend during the period of our study. Road rage incidents represent a multifactorial phenomenon that cannot be easily explained. A possible explanation regarding the upward trend (as demonstrated in Fig. 4) can be the increased number of circulating vehicles (Ntiveris 2020) (e.g., during 2019, 114,109 new vehicles entered circulation with most of them located in Athens Metropolitan area). Another factor that may account for the increase is the appearance of various food delivery services (Wolt 2024) that mainly use motorcycles and thus possibly lead to relevant incidents (e.g., Wolt expanded to Greece during 2019). Nevertheless, further study is required to ascertain other, non-evident, causes of this trend.

A somehow unexpected result of our study is that road rage cases did not exhibit any apparent drop in frequency during the restriction measures (Sakelliadis et al. 2020) (lockdown and restriction of circulation) enacted in Greece due the COVID-19 pandemic (spring and autumn of 2020), possibly because the stress due to the

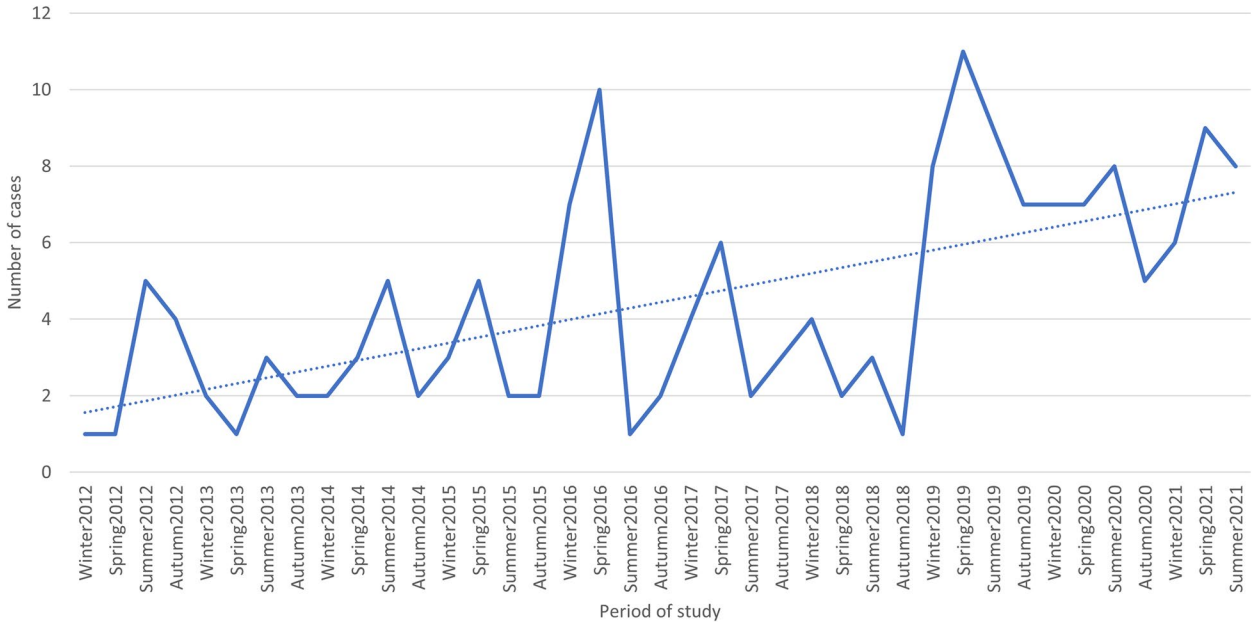

Fig. 4 Line graph showing distribution of cases during the study period

novel public health crisis may have led to an increase in road rage quarrels, or due to the public's unwillingness to comply with the restrictions imposed at the time.

According to both the existing literature, and our results, road rage are most triggered by minor conflicts, possibly due to psychological factors of the perpetrator, but still further research is required to draw safer conclusions.

Conclusions

Road rage incidents are most triggered by minor conflicts, possibly due to psychological factors of the perpetrator. A gradually upward trend of such incidents is observed during the period of our study. Perpetrators used mostly just their hands and feet, or even their head as a blunt force instrument to inflict injuries. In most cases, multiple injuries were observed on the victims. The predominant injury site was by far the head-neck region, followed by the upper extremities. Approximately more than one third of injuries observed could be characterized as grievous.

The road rage phenomenon involves a great deal of people that transit every day to their destination. The description of the characteristics of this phenomenon may provide useful information that can lead to the enactment of possible preventive measures. Legislative changes that would impose strict penalties are warranted. Currently, there is no special legal framework relevant to road rage in Greece. Future legislation should provide strict penalties for road rage perpetrators (e.g., suspension of the driver's license or fines). We strongly believe that breathalyzer tests and psychiatric evaluation should become a routine protocol for both road rage victims and perpetrators. The road rage phenomenon involves a complex emotional response which includes several stages. Regulation of this emotional response may represent the only preventive solution.

As already mentioned, further research concerning possible relation between road rage perpetration and other, not immediately apparent violent acts, such as domestic violence is warranted. Finally, future research should explore the impact of various intervention strategies on reducing road rage incidents, drawing on case studies or pilot programs.

Limitations

Main limitation of our study is the sample itself. It is imperative to keep in mind that the sample does not include data from all road rage incidents that took place during the specified study time. Cases included are only those that have judicial interest, and in fact those in which the victim decided to follow the police "prodding" to undergo a forensic clinical examination. Furthermore, our department covers only certain areas of jurisdiction in the region of Attica, Greece (North-East and South-East areas).

Victims may often provide unreliable data, either due to confusion, which is to be expected during the incident, or due to inability to provide the information necessary

for the records kept by our department, especially concerning the personal information of the perpetrator.

Finally, due to the design of the study and to the nature of the data available, findings identify correlations and not causational relationships.

Nevertheless, we believe that this study is the first step toward awareness of the phenomenon of road rage in Greece, and that further research is required, to draw more accurate conclusions.

Abbreviations

RTA Road traffic accident
DFMT Department of Forensic Medicine and Toxicology

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None.

Authors' contributions
Dimitrios Kouzos drafted the manuscript and performed data collection. Konstantinos Katsos drafted the manuscript and performed data collection. Ioanna Anastopoulou performed statistical analysis. Christoforos Kolentinis drafted the manuscript and performed data collection. Nikolaos Goutas performed correction to the manuscript. Dimitrios Vlachodimitropoulos performed correction to the manuscript. Konstantinos Moraitis performed critical corrections to the manuscript. Chara Spiliopoulou conceived the paper and performed corrections to the manuscript. Emmanouil I. Sakelliadis performed critical corrections to the manuscript and was responsible for overall supervision.

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Obtained.

Consent for publication
Given by all authors.

Competing interests
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