ORIGINAL ARTICLE

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Child homicide in northern Tunisia: a retrospective study of forensic autopsy cases

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Abstract

Background: As far as we know, no previous research has investigated child homicide in Tunisia. In this context, our study was carried out to analyze the epidemiological and medico-legal characteristics of child homicide occurring in northern Tunisia over a 17-year period.

Results: Eighty-seven cases were collected, with a male-to-female ratio of 2.4. The mean age of the victims was 12.6 years for both sexes. We found that 56.3% of the cases were aged between 15 and 18 years. The majority of deaths under 15 years of age occurred at home as a result of intrafamilial homicide. Victims aged more than 15 years were more likely to be assaulted outside the home by a non-family member.

The most frequent method of homicide was sharp force (39%) affecting mostly the heart and the lung, followed by blunt trauma (25%), which affected mainly the head. Sexual assault was diagnosed at autopsy in six victims (6.9%).

Conclusions: The study offers available data concerning the patterns of child homicide in northern Tunisia and may help to implement preventive measures against this kind of crime.

Keywords: Child, Homicide, Autopsy, Tunisia

Background

The World Health Organization defines violence against children as "all forms of violence against people under 18 years old, whether perpetrated by parents or other caregivers, peers, romantic partners, or strangers". Approximately, up to 1 billion children (half of the world's children) are affected each year by physical, emotional, or sexual violence (World Health Organization, 2020b). Child homicide represents the extreme form of violence against children, generally attracts the attention of society, and represents a difficult challenge that the forensic pathologist can face (Cordner et al., 2001). Child homicide is defined as the killing of a child intentionally by one person or more (Alder & Polk, 2001).

Homicide is among the top four causes of death in adolescents (World Health Organization, 2020b).

The rates of this phenomenon vary between communities because of social and economic differences and vary in different periods for the same society. In 2017, the global rate of homicide for children aged between 0 and 17 years was estimated at about 1.7 homicide deaths per 100,000 population (World Health Organization, 2020a).

The rates of child homicide are generally underestimated because many cases can be identified as accidental, sudden, or undetermined infant deaths (Christoffel & Zieserl, 1985).

No previous reports have studied child homicides committed on the territory of Tunisia.

Our study aimed to analyze the epidemiological aspects and medico-legal characteristics of children, killed in northern Tunisia over a 17-year period extending from 2003 to 2019.

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Grayaa *et al. Egypt J Forensic Sci*   (2021) 11:32

Page 2 of 7

Methods

This retrospective descriptive study was conducted in the Department of Forensic Medicine over 17 years (January 2003–December 2019). In Tunisia, forensic autopsies are carried out for unexpected, suspicious, and violent deaths after the decision of the prosecutor. Our department covers the medico-legal activity of 10 to 11 governorates of the northern part of Tunisia, which represents 42% of the Tunisian population.

Our study included all cases of child homicide. A child is defined as a human being under the age of 18 years (Convention on the Rights of the Child- The Children's Version, 2009). Children under 1 year were excluded because they had specific characteristics.

Data was collected from police investigation records, deceased relative's commemoratives, forensic autopsy reports, and laboratory findings.

We analyzed socio-demographic variables (age, sex, education, and origin), circumstances of homicide (the place and the date of the crime, the time interval between the injury and death, the place of the death, the relationship between the victim and the perpetrator, the motive and the method of the homicide), and the cause and the manner of death.

For the purpose of our study, victims' ages were divided into four groups: 1–4, 5–9, 10–14, and 15–18.

The death was considered as a homicide after a full-scale autopsy and after recording police investigations.

Statistical analysis

The statistical package SPSS for Windows, version 22.0 was used in the analysis of the results. For quantitative variables, descriptive statistics were calculated as frequency and percent. For quantitative variables, descriptive statistics were given as mean ± standard deviation. For comparing categorical variables, we used the chi-square test. *P* values < 0.05 were defined as statistically significant. We also calculated the R^2 determination coefficient in trend lines.

Ethics approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee. This study was performed in accordance with the Declaration of Helsinki. All the data was anonymized.

Results

A total number of 26,688 forensic autopsies were carried out during the 17 years from 1 January 2003 to 31 December 2019. Out of those, 1824 (6.8%) concerned children aged between 1 and 18 years. In all, 87 cases were victims of child homicide (4.7%). The highest rate of homicide was witnessed in 2004 (14 cases, 16%) and 2012 (10 cases, 11.5%) while the lowest rate was collected in 2005 (one case) and 2013 (one case) (Fig. 1). There was no rise in the number of cases after the Tunisian Revolution (14 January 2011).

Victims' characterization

The mean age of the victims was 12.6 years ± 5.6 for both sexes. More than half of the victims (56.3%) were aged between 15 and 18 years. Victims were mainly males (72.4%), with a male-to-female ratio of 2.4. The distribution of the cases by age group and sex is shown in Table 1. Males were predominant among all age groups except the group of 1 to 4 years where there was a slight preponderance of females (male-to-female ratio of 0.9).
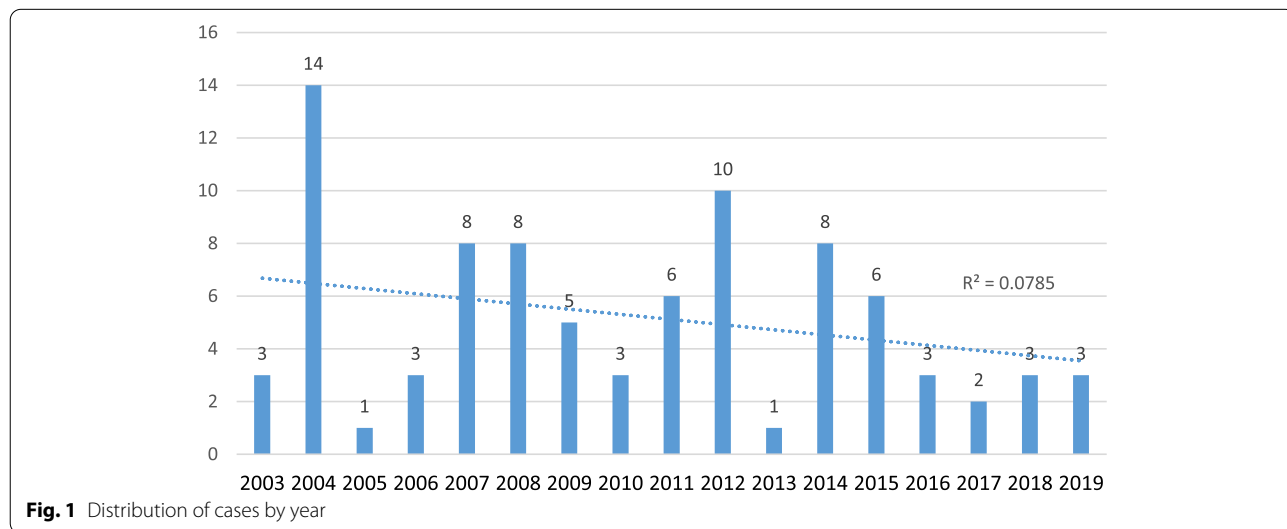

Fig. 1 Distribution of cases by year

Grayaa *et al. Egypt J Forensic Sci*   (2021) 11:32

Page 3 of 7

Table 1 Distribution of cases by sex and age group

Age group		1–4 years	5–9 years	10–14 years	15–18 years	Total
Sex	Male	7	6	7	43	63
	Female	8	5	5	6	24
Total		15	11	12	49	87

Among the victims aged between 15 and 18 years, there was an important male predominance (88%) with a male-to-female ratio of 7/1. All the victims were single, except one girl aged 17 years who was married. Most families were comprised of two parents legally married. We found that 43% of the victims were pursuing primary or secondary education during the crime, while 30% had left school and 17% were aged under 6 years (age to enter school). We had no available information concerning the education of 10% of victims.

Homicide circumstances

In the reported cases, seasonal distribution demonstrated that homicides occurred more frequently in summer and spring (29.9% and 33.3%, respectively) than in autumn and winter (19.5% and 17.2%, respectively) (Fig. 2). We recorded three peaks of incidence in May (17.2%), July (13.8%), and August (13.8%) (Fig. 3). There was no rise in cases on the weekends (Fig. 4). The majority of homicides occurred in urban areas (49%). Thirty percent of the incidents took place in rural areas. We had no information on the area in the remaining cases (21%). Girls were more likely to be assaulted in rural areas compared with boys, 52% versus 22%, respectively.

The crime mainly occurred in public places (34.5%), followed by homes (27.6%), isolated places (25.6%), and private places (6.9%). The scene of the crime was undetermined in 5% of the cases. There were significantly more victims assaulted at home when they were aged under 15 years compared with victims aged more than 15 years ($p = 0.014$). Most of the victims were found dead at the crime scene (63.3%). The remaining cases of victims died at the hospital or during transport to the hospital. Death occurred on the same day of the injuries in 77% of cases. The average number of days between the fatal incident and the death was 5 days (SD ± 20).

Intra-familial homicide accounted for 22 cases (25%): nine cases were killed by their mother (in one case the crime was committed by the mother and the stepfather and in another case the two parents participated in the crime), five cases were killed by their father only, five cases were killed by their brothers, and two by their cousins. Children aged up to 14 years were more likely to be assaulted by a family member compared to children aged between 15 and 18 years ($p = 0.001$). Girls were more likely to be killed by a family member compared to boys who were mostly killed by strangers ($p = 0.009$). Eight cases were assaulted by their neighbors. Four children were assaulted by the police after a police pursuit, terrorism, and during the Tunisian Revolution events. A boy aged 4 years was killed by a terrorist. Forty-three victims (49%) were assaulted by persons without
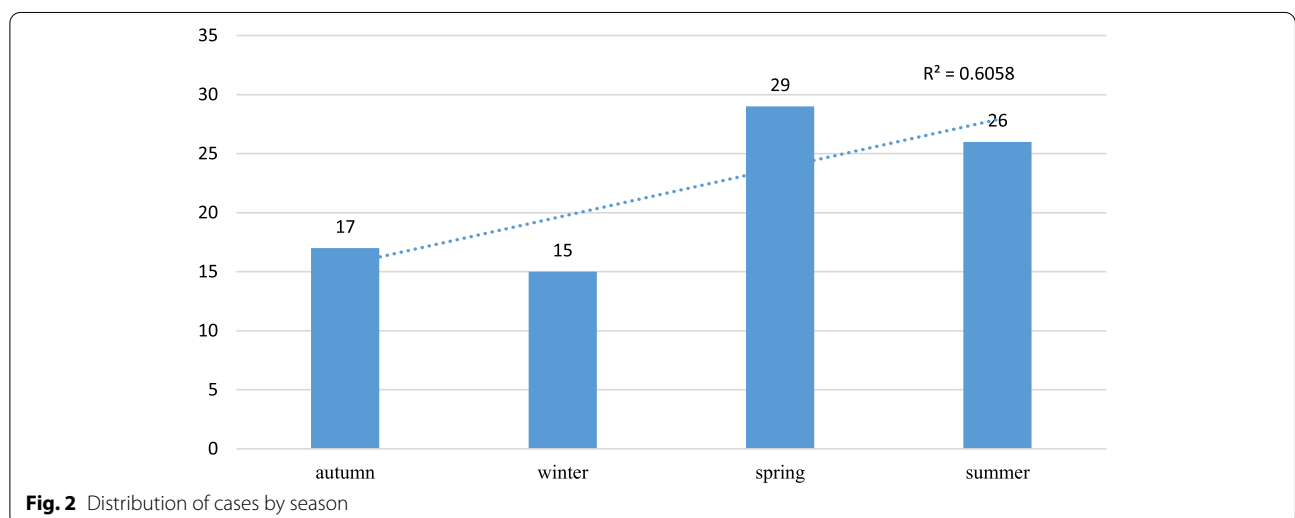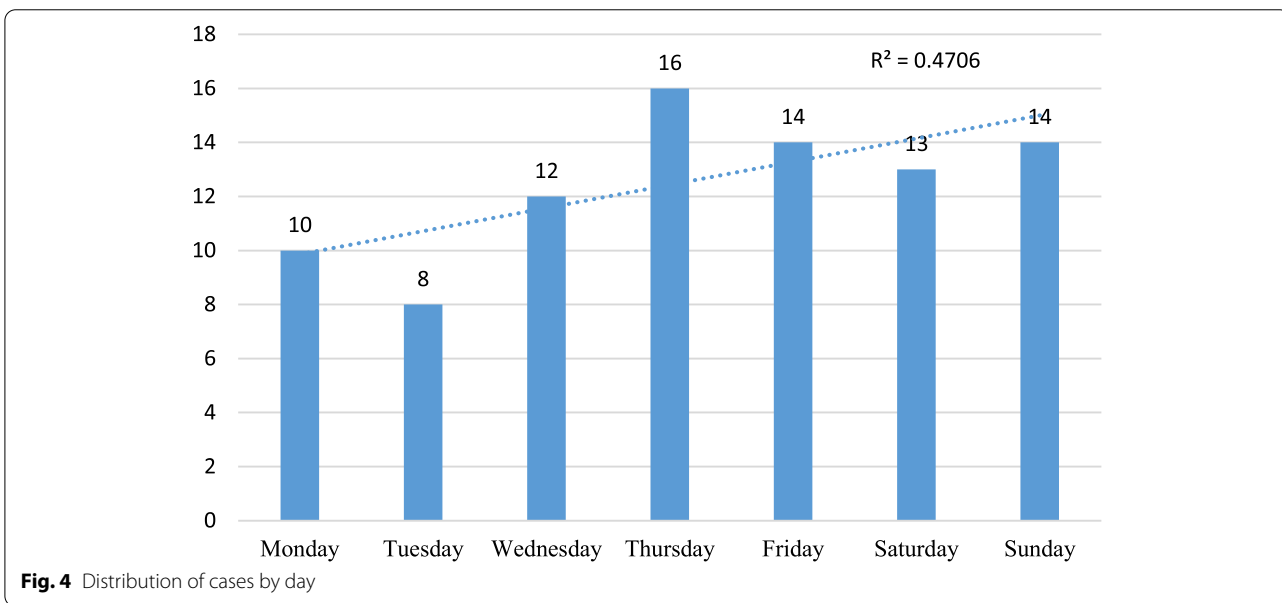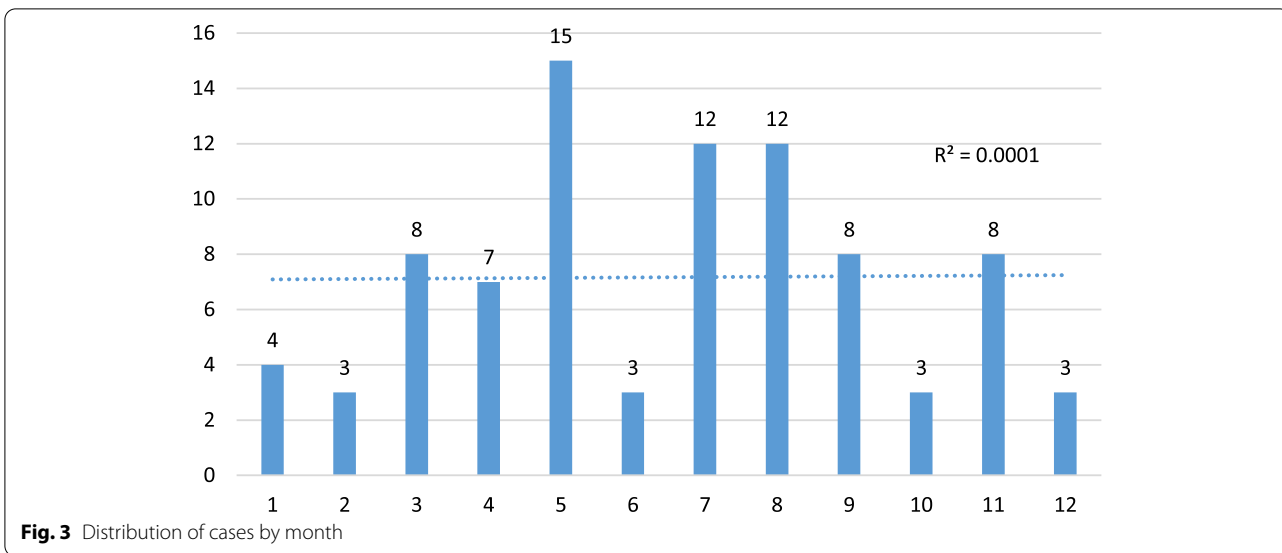

Fig. 2 Distribution of cases by season

Grayaa *et al. Egypt J Forensic Sci*   (2021) 11:32

Page 4 of 7

Fig. 3 Distribution of cases by month

Fig. 4 Distribution of cases by day

any relationship between the victim and the killer or unknown perpetrator.

Unfortunately, we had no information regarding the characteristics and the presence or not of psychiatric illness of the perpetrators. The motive of the crime was also unknown in many cases because of the retrospective nature of our study. Quarreling was the most frequent motive of murder reported (42% of cases). The most frequent methods of homicide were sharp force (39%) and blunt trauma (25%), followed by strangulation and suffocation (9%), firearms (7%), burns (4%), and drowning (3%). Ligature strangulation was noted

in five cases and manual strangulation in three cases. Death resulted from a combination of two methods in five cases: blunt trauma and suffocation in one case, burn and sharp force in one case, blunt trauma and sharp force in two cases, and burn and suffocation in one case. We found a case of using three methods of homicide in killing a boy aged 11 years (sharp force, blunt trauma, and burn). There was no significant correlation between the method of homicide and sex ($p = 0.084$). Among the 15–18 age group, sharp force only accounted for 52% of the deaths. In other two cases of this age group, sharp force was combined with

Grayaa *et al. Egypt J Forensic Sci*   (2021) 11:32

Page 5 of 7

other methods. The distribution of methods of homicide by age group is shown in Table 2.

Autopsy findings

Among cases where death was attributed to sharp force, the heart was the most affected organ (70%) followed by the lung (35%). We found that blunt trauma affected the head in 80% of cases, causing fatal head injuries. Asphyxia was diagnosed in 17% of cases; three of those cases were caused by drowning. Broncho-pneumonia was the cause of death in a case of abuse and neglect of a child aged 6 years, causing malnutrition and complications. For children aged between 1 and 14 years, the most frequent mechanism of death was neurological shock (38%) while it was hemorrhagic shock for children older than 15 years (55%) ($p = 0.4$). Sexual assault was diagnosed in six victims (6.9%): three boys aged 11, 16, and 17 years and three girls aged between 10 and 14 years. In these cases, the most common cause of death was suffocation/strangulation (4/6). The toxicological analyses performed during the autopsy in almost all cases (90%) showed three cases positive for ethyl alcohol and positive four cases for cannabis.

Discussion

In our study, the rate of child homicide was 4.7% of all children's deaths autopsied medico-legally. This rate is the same as that obtained in a study conducted in Budapest (4.8%) (Tör et al., 2010). There was no rise in the rate of child homicide before and after the Tunisian Revolution. Contrary to what was observed by Ben Khelil et al. (Ben Khelil et al., 2018), the homicide rate among all ages included had slightly increased after the Revolution, with a significant rise during the first 2 years due to social and economic disturbances. In our study, a rise in child homicide during adolescence was observed with 56.3% of the victims aged between 15 and 18 years. Indeed, when children grow, they spend more time outside and on the internet. They start to interact with and encounter more people, including colleagues, friends, and romantic partners. This opening of the social world creates situations in which children may be exposed to new forms of violence (United Nations Children's Fund (UNICEF), 2017).

Consistent with other reports (Moniruzzaman & Andersson, 2005; Ross et al., 2009; Lucas et al., 2002), our study showed that child homicide occurred more frequently among males with a sex ratio of 2.4. However, this finding differed from those of other researchers where females outnumbered males in all age groups (Lyman et al., 2003; Schloesser et al., 1992). Among the 15–18 year old group, there was a strong predominance of boys, with a male-to-female ratio of 7/1, in agreement with reports of the WHO and those carried out in Taiwan and the USA (David Finkelhor, 2001; Lee & Lathrop, 2010). This could be explained by the fact that boys at this age spend more time outside their homes, which exposes them to quarrels and other forms of violence (Office of Juvenile Justice and Delinquency Prevention, 2003).

Our study showed a correlation in the seasonal distribution of the investigated cases where killing children was more likely to occur in spring and summer (33% and 30%, respectively). However, a study conducted in Budapest did not show any significant seasonal differences (Tör et al., 2010).

Victims were mainly assaulted in urban areas. However, girls were more likely to be assaulted in rural areas (52%) compared to boys (22%). This could be explained by the significant sex discrimination in these rural areas, where the role of the female is still underestimated and where families are less tolerant towards girls. So, they are more exposed to family violence.

The highest number of homicides took place in public places (34.5%), followed by homes (27.6%) and isolated places (25.6%). As highlighted in other reports (Baralic et al., 2010; Makhlouf & Rambaud, 2014), among victims aged under 15 years, the majority of deaths occurred at home ($p = 0.014$). This observation could be accounted for by the fact that the majority of perpetrators in this age group were family members. On the other hand, victims

Table 2 Distribution of cases by age group and method of homicide

Age group		1–4 years	5–9 years	10–14 years	15–18 years	Total
Homicide method	Sharp force	4	4	0	26	34
	Firearm	1	1	0	4	6
	Blunt trauma	6	2	4	10	22
	Drowning	1	0	1	1	3
	Strangulation/suffocation	1	2	3	2	8
	Burn	1	0	1	2	4
	Combined method	0	1	3	2	6

aged between 15 and 18 years, were more frequently killed outside their homes. In concordance with a study conducted in Belgrade, the majority of the victims were found dead at the crime scene (63.3%) (Baralic et al., 2010).

A quarter of the reported homicides were committed by family members, with mothers being the most common perpetrators (40%). Other family members involved in child homicides were the father, the stepfather, the brother, and the cousin.

There was a significant correlation between the victim's age and familial homicide. Children aged under 15 years were commonly killed by a member of their family ($p = 0.001$). These results are in agreement with those of previous studies carried out in Budapest and Belgrade (Tör et al., 2010; Baralic et al., 2010). Similar to studies conducted in global homicide (Vazsonyi et al., 2014), girls were more frequently killed by family members compared to boys where the perpetrators were usually strangers.

Sharp force and blunt trauma were the most frequent methods of child homicide in our study (39% and 25%, respectively). This could be explained by the characteristics of our population study, which is composed essentially of children aged between 15 and 18 years. In this age group, sharp force injuries were common, as highlighted by other studies of child homicide (Batalis & Collins, 2005; Sauvageau & Racette, 2008). In our study, there were rare cases of shooting. In contrast with other reports, shooting was predominant as a method of child homicide (Batalis & Collins, 2005; Sauvageau & Racette, 2008). This was due to the non-availability of firearms and the severe laws concerning the possession of weapons in Tunisia.

In our study, the most common mechanism of death for children aged under 14 was hemorrhagic shock (55%). Neurogenic shock was the most frequent mechanism of death among victims aged 15 years and older (38%). A study conducted in Taiwan showed that the death mechanism varied between different age groups. The most common mechanisms of death were neurogenic shock, asphyxia, and hemorrhagic shock in victims aged between 0 and 5, 6 and 12, and 13 and 17, respectively (Hwa et al., 2015).

Sexual homicide was diagnosed in 6.9% of victims autopsied. This percentage was higher than those noted in other reports from the USA, where the percentages varied between 1 and 4% (Van Patten & Delhauer, 2007). However, the rate of sexual homicide in South Africa accounted for 10% where the notions of masculinity and the governance of men were widespread (Mathews et al., 2013a, 2013b). Sexual homicide rates could be underestimated because postmortem diagnosis of sexual assault is generally missed (Van Patten & Delhauer, 2007). Besides, there are differences in the definition of sexual homicide that can be a factor in underestimating the rate, as well as differences between countries. The most forensic definition was used by Meloy (Meloy, 2000) who defined it as "when there is either physical evidence of sexual activity in close temporal or physical proximity to the crime or crime victim; or a legally admissible statement by the perpetrator of sexual activity." In the majority of cases reported, the homicide was carried out to hide the sexual assault.

To the best of our knowledge, our study was the first exhaustive report including all cases of child homicide conducted in northern Tunisia. It allowed us to compare our results with international data.

However, our study had some limitations. It was a retrospective study based on the only data available at the time of autopsy. Information such as the motive of the crime, the history of previous violence against the victims, the characteristics, and the medical history of the perpetrators were mostly not available.

Conclusions

Our study has enabled us to investigate the patterns of child homicides that have taken place in northern Tunisia over a 17-year period. A higher male predominance was observed among those in the 15–18 age group, who were more likely to be assaulted outside the home by a non-family member. The most frequent methods of death were sharp force and blunt trauma. Forensic investigations and autopsy findings have an important role in determining the cause and manner of death and distinguishing between homicidal, accidental, sudden, and undetermined deaths among children. All efforts should be made to detect and diagnose such situations in order to develop preventive strategies, including medical and social services.

Grayaa *et al. Egypt J Forensic Sci*   (2021) 11:32

Page 7 of 7

Declarations

Ethics approval and consent to participate
All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee. This study was performed in accordance with the Declaration of Helsinki. All data were anonymized.
The reference number is not available.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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