Pattern and Risk Factors of Suicide Mortality in Children among Cases arrived at Menoufia University Hospitals and analysis through the Suicide Assessment Five-Step Evaluation and Triage

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KEYWORDS
Suicide, Deaths, Children, Risk, SAFE-T.

ABSTRACT

Suicide deaths in children is a significant health problem worldwide which needs proper assessment and interventions. Hence the current study was conducted to give an overview on pattern and risk factors of suicide mortalities in children among cases arrived at Menoufia university hospital, with psychiatric analysis and assessment for such cases through the Suicide Assessment Five-Step Evaluation and Triage (SAFE-T). This analytical cross-sectional study included all suicidal self-poisoned and self-injured children cases attended to poison control center or emergency department in Menoufia University hospital from 1st of March 2021 to the 31st of August 2022. Data were collected through questionnaire which involved demographic data and risk factors for suicidal attempt. Psychiatric data were collected through "SAFE-T". 613 cases were included and classified to survived (503) and dead cases (110). 82.7% of the cases were in the age group of 14-18 years with girls' predominance. Phosphide poisoning and burn were the most widely used methods among dead cases. Binary logistic regression revealed that boys, chronic diseases, child abuse, drug abuse, family troubles, previous suicide attempts, delayed arrival to hospital and phosphides use were significant risk factors for children's suicidal deaths. According to SAFE-T, 64.5% of the dead cases were high risk and the use of phosphides was more prevalent among them. Phosphides poisoning was among the most significant risk factors for suicide deaths in children, also it was confirmed to be the commonest among high-risk suicide deaths after assessment with SAFE-T hence more strict measures are required to prevent their availability.

Introduction

Deliberate self-harm is the act of intentionally causing physical harm to oneself inflicting damage to the body, whereas deliberate self-poisoning is the act of consuming dangerous substances such as chemicals or drugs. However, these acts are mostly impulsive and are committed without ill intent, they can be catastrophic and fatal (Abhilash et al., 2022).

Suicide represents a major health problem worldwide and can affect all people of different ages, including children (Marzec et al., 2021). It is the main cause of death among age group 10–19-years in developing countries and the second main cause of death in more economically developed countries as the European region (WHO, 2018).

The rate of suicide among Egyptian children has grown drastically to 14.3% (Farahat et al., 2022). However suicidal incidents are usually underreported for a

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variety of cultural and religious reasons, hence there are no official statistics on the number of suicidal cases in Egypt (WHO, 2011).

Children and adolescents' choice for the suicide methods is greatly affected by their availability. They commonly harm themselves by self-poisoning or by self-injuries through cuttings, jumping from heights, firearms, hanging and railway suicides (Hepp et al., 2012).

Suicide attempts are frequently impulsive in younger children. They also may be linked to issues with attentiveness and hyperactivity, as well as feelings of despair, confusion, and frustration (Auerbach et al., 2017).

In teenagers, sentiments of stress, self-doubt, pressure to excel and succeed, financial insecurity, loss and disappointment may be involved in suicide attempts. Some of them may find suicide as the only way to get rid of their problems (Lakshmi et al., 2022).

Depression and suicidal thoughts and attempts are frequently linked. Other risk factors in addition to depression include rejection, acute loss, bullying, helplessness or feelings of hopelessness, availability of suicide methods, aggressive or impulsive behavior, family history of suicidal attempts and physical abuse (Klomek et al., 2007).

Suicidal attempts serve as a significant predictor of possible future suicides, and people who have survived such attempts have a significantly lower risk of committing suicide in the future if they have access to good psychiatric care. Therefore, it is important to identify those who have attempted suicide and provide them with appropriate psychiatric therapy (Spiller et al., 2020; El- Farouny and Helmy 2021).

The Suicide Assessment Five-Step Evaluation and Triage (SAFE-T) instrument directs clinicians in the identification of risk and protective factors, suicidal thoughts inquiry, plans, behavior, and intent, the assessment of risk level, and the selection of the most appropriate intervention. The American Psychiatric Association Practice Guidelines for Suicide Assessment are incorporated into SAFE-T. It has been demonstrated that teaching the SAFE-T to emergency department nurses will improve suicide inquiry, increase understanding of identifying protective and risk factors and assessment of risk level, and determine appropriate intervention (Brodsky et al., 2018).

According to our knowledge, nearly no investigations had studied suicidal deaths in children as regard both self-poisoning and self-harm in Menoufia. Therefore, the purpose of this research was to focus on the pattern and risk factors of suicide deaths in children by both self-poisoning and self-injuries among the cases arrived at Menoufia university hospital, with psychiatric analysis and assessment for such cases through SAFE-T.

Subjects and Methods:

This is an analytical cross-sectional study included all suicidal self-poisoned and self-injured children cases attended to poison control center or emergency department in Menoufia University hospital over one and half year from the 1st of March 2021 to the 31st of August 2022.

Ethical considerations: The study was approved by the Institutional Review Board (IRB No. 11/2022FORE24-1) of the Ethical Committee of Faculty of Medicine, Menoufia University. Written informed consent was signed by the case guardian after explanation of the aim of the study. Patient confidentiality

was maintained according to the Helsinki Declaration.

Participants: The study included all children (in the age group between 7-18 years old) who presented to the ED with either self-poisoning or self-injury. The uncooperative cases who refused to share in the study or to sign the consent and cases with unclear history of suicide were excluded.

Data collection: patients or their caregivers were asked to answer a predesigned questionnaire which involved demographic information about age, gender, residence, occupation, as well as questions about the manner and motives of suicide, time of hospital arrival, history of prior suicidal attempts and associated risk factors for suicidal attempt. An interview with a psychiatrist was done for evaluation of risk factors of suicide.

a) **For self-poisoning cases:** The type of poison used was identified from the history provided by the patients or their caregivers, clinical examination, laboratory investigations and toxicological laboratory tests (cholinesterase level and thin layer chromatography for organophosphorus, silver nitrate test for aluminum phosphide and drug screening tests) on admission. The severity of poisoned cases was evaluated on admission using the poisoning severity score (PSS), a rating scale that divides poisoned cases into four classes: zero (0): no obvious poisoning symptoms or signs; Minor (1): symptoms that are mild, intermittent and recover spontaneously, Moderate (2): symptoms that are pronounced or continuous. Extreme or life-threatening symptoms are classified as severe (3). Fatal (4): Death (Persson et al., 1998).

b) **For self-injury cases:** Legal classification of injuries was used to classify severity of injuries into simple, dangerous, and fatal injuries (depending on the amount of damage) (Krishan, 2011). Simple wounds are those that heal in less than 20 days without causing disability or permanent deformity. Dangerous injuries include those that heal in less than 20 days and leave permanent infirmity or disfigurement, take longer than 20 days to heal with or without leaving permanent infirmity, endanger the patient's life, cause excruciating pain, or prevent them from performing their regular jobs for at least 20 days. While fatal injuries are those that result in death as a result of the wound itself either immediately following the injury or later as a result of its complications.

The psychiatric interview has been done in the departments where the patients were admitted, and data collected from the relatives of the patients who were in critical settings or from the patients who were able to communicate properly. The interview was done with confidentiality. Psychiatric data were collected and assessed through Suicide Assessment Five-Step Evaluation and Triage for Clinicians “SAFE-T" (Fowler, 2012) which includes:

1. **Risk Factors:** study the suicidal behavior, presence or absence of certain depressive symptoms, anhedonia, impulsivity and hopelessness. They also, study the presence or absence of stressors and interpersonal conflicts, triggering events and history of abuse whether physical or sexual. In addition, it investigates the accessibility of the methods of suicide.
2. **Protective Factors:** may not counteract major immediate risk even if they present.

They may be internal as, religious beliefs, coping skills with stress and frustration tolerance or external as social supports.

3. **Suicide Inquiry:** Specific inquiries about suicide thoughts (the frequency, intensity, duration over the previous 48 hours, the past month, and the worst ever), plans, behaviors (as past attempts and aborted attempts) and intent. It also, investigates ambivalence (reasons to live versus reasons to die).
4. **Risk Level:** After completing steps 1-3, the risk level is determined through the clinical judgement. Reassessment is needed as the patient's or the environment's circumstances change, then the patients are categorized into:
   - **a)** High risk: the patient has severe symptoms or acute immediate risk, no protective factors and potentially lethal suicide attempt or persistent suicide ideations with strong intent.
   - **b)** Moderate risk: the patient has multiple risk factors and few protective factors, also has suicidal thoughts with plan, but no intent or behavior.
   - **c)** Low risk: the patient has modifiable risk factors, strong protective factors, and death thoughts but no plan, intent, or behavior (Brenner et al., 2020).

Statistical analysis

Data were analyzed using SPSS Version 23 (IBM Corp., Armonk, N.Y., USA). Categorical data were presented as numbers and percent. The Chi-square test ($\chi 2$) was used to compare dichotomous variables and Z test was used to compare the proportions of two different groups. All significant variables in the univariate analysis were subjected to binary logistic regression to detect the riskiest factors for suicidal deaths with the risk assessed by Odds ratio at 95% confidence intervals (CI). A two-sided P value of less than 0.05 was considered statistically significant.

Results:

During the study period, the total number of suicidal self-poisoning and self-injured children's cases was 613 patients. The cases were classified according to their outcome to survived cases (503) and dead cases (110) (died within 1 day to 5 weeks from admission). Of the cases, (82.7%) were in the age group of 14-18 years with girls' predominance (68.2%). Cases from rural areas represented 66.7% of all cases. Most cases were students (79.3%). As regards marital status, 88.7% of patients were single.

On trying to identify the risk factors linked to suicide fatalities, it was discovered that there was non-significant difference between survived and dead cases regarding their age, residence, education, occupation. Regarding the gender, girls were more likely than boys to attempt suicide, although boys died at a higher rate than girls (Table 1).

Table (1): Distribution of the cases according to their demographic data and outcome (n=613).

Variables	Total cases (n=613)						Z test	P value
	Survived cases (n=503)			Died cases (n=110)				
	Poison (n=444)	Trauma (n=59)	Total (n=503)	Poison (n=102)	Trauma (n=8)	Total (n=110)		
Age (years)								
7 - <14	82	6	88 (17.5%)	17	1	18 (16.4%)	Z=0.28	P = 0.77
≥ 14 -18	362	53	415 (82.5%)	85	7	92 (83.6%)	Z=0.27	P = 0.78
Gender								
Boys	112	36	148 (29.4%)	42	5	47 (42.7%)	Z=2.7	P = 0.006*
Girls	332	23	355 (70.6%)	60	3	63 (57.3%)	Z=2.8	P = 0.007*
Residence								
Rural	290	42	332 (66%)	73	4	77 (70%)	Z=0.80	P = 0.42
urban	154	17	171 (34%)	29	5	34 (30%)	Z=0.62	P = .53
Education								
Illiterate	87	18	105 (20.9%)	15	4	19 (17.3%)	Z=0.85	P = 0.39
Educated	357	41	398 (79.1%)	87	4	91 (82.7%)	Z=0.86	P = 0.40
Occupation								
Student	357	41	398 (79.1%)	87	1	88 (80%)	Z=0.21	P = 0.83
Worker	32	10	42 (8.4%)	8	4	12 (10.9%)	Z=0.86	P = 0.39
Not working	55	8	63 (12.5%)	7	3	10 (9.1%)	Z=1.01	P = 0.31
Marital status								
Single	393	53	446 (88.7%)	93	5	98 (89.1%)	Z=0.12	P = 0.89
Married	48	4	52 (10.3%)	6	2	8 (7.3%)	Z=0.98	P = 0.32
Divorced	3	2	5 (1.0%)	3	1	4 (3.6%)	Z=2.1	P = 0.03*

n= number, Z= Z test, *significant (P value <0.05)

A highly statistically significant relationship was found between survived and dead cases as regard presence of a history of previous suicide attempts (P <0.000).

The time of hospital arrival was important risk factors associated with suicidal deaths as 70.9% of dead patients arrived the hospital after more than 2 hours versus only 29.1% of them arrived within 2 hours.

Similarly, it was found that having a history of chronic diseases, child abuse and drug abuse (cannabis, tramadol, and methamphetamine) were statistically significant between survived and dead cases (4.0%, 5.6% and 11.3% respectively in survived cases versus 11.8%, 32.7% and 26.4% in dead cases).

As regards motives for suicidal attempts, family problems were much more frequent among dead cases (58.2%) than among survivors (33.6%), but school failure was notably the most prevalent motive for suicide among those who survived (40.9%), followed by relationship failure (13.5%) (Table 2).

Table (2): Distribution of the cases according to risk factors of suicide deaths in all studied children and outcome (n=613).

Variables	Survived cases (n=503)			Died cases (n=110)			Z test	P value
	Poison (n=444)	Trauma (n=59)	Total (n=503)	Poison (n=102)	Trauma (n=8)	Total cases (n=110)		
Location of committing suicide								
At home	372	32	404 (80.3%)	76	4	80 (72.7%)	Z=1.7	P =0 .07
Outside home	72	27	99 (19.7%)	26	4	30 (27.3%)	Z=1.8	P =0 .08
Previous attempts of suicide								
Zero	427	43	470 (93.4%)	46	4	50 (45.5%)	Z=12.7	P= <.000**
1	11	12	23 (4.6%)	49	3	52 (47.3%)	Z=12.3	P= <.000**
>1	6	4	10 (2.0%)	7	1	8 (7.2%)	Z=2.9	P = 0.002*
Time of hospital arrival								
Within 2 hours	198	15	213 (42.3%)	31	1	32 (29.1%)	Z=2.5	P= 0.01*
More than 2 hours	246	44	290 (57.7%)	71	7	78 (70.9%)	Z=2.6	P= 0.01*
History of chronic diseases								
Yes	11	9	20 (4.0%)	8	5	13 (11.8%)	Z=3.3	P= 0.001*
No	433	50	483 (96.0%)	94	3	97 (88.2%)	Z=3.3	P= 0.001*
History of child abuse								
Yes	15	13	28 (5.6%)	30	6	36 (32.7%)	Z=8.4	P=<.000**
No	429	46	475 (94.4%)	72	2	74 (67.3%)	Z=8.4	P= <.000**
History of drug abuse								
Yes	30	27	57 (11.3%)	21	8	29 (26.4%)	Z=4.1	P= <.000**
No	414	32	446 (88.7%)	81	0	81 (73.6%)	Z=4.1	P= <.000**
Motives for suicide								
Psychological	23	6	29 (5.8%)	4	0	4 (3.6%)	Z=0.89	P = 0.36
School failure	191	15	206 (40.9%)	29	2	31(6.2%)	Z=2.5	P =0 .01*
Relation failure	56	12	68 (13.5%)	5	1	6 (5.5%)	Z=2.3	P = 0.01*
Family problems	145	24	169 (33.6%)	60	4	64 (58.2%)	Z=4.8	P= <.000**
Death of dear	29	2	31 (6.2%)	4	1	5 (4.5%)	Z=0.65	P= 0.52

n=number, Z= Z test, **highly significant (P value <0.001), *significant (P<0.05)

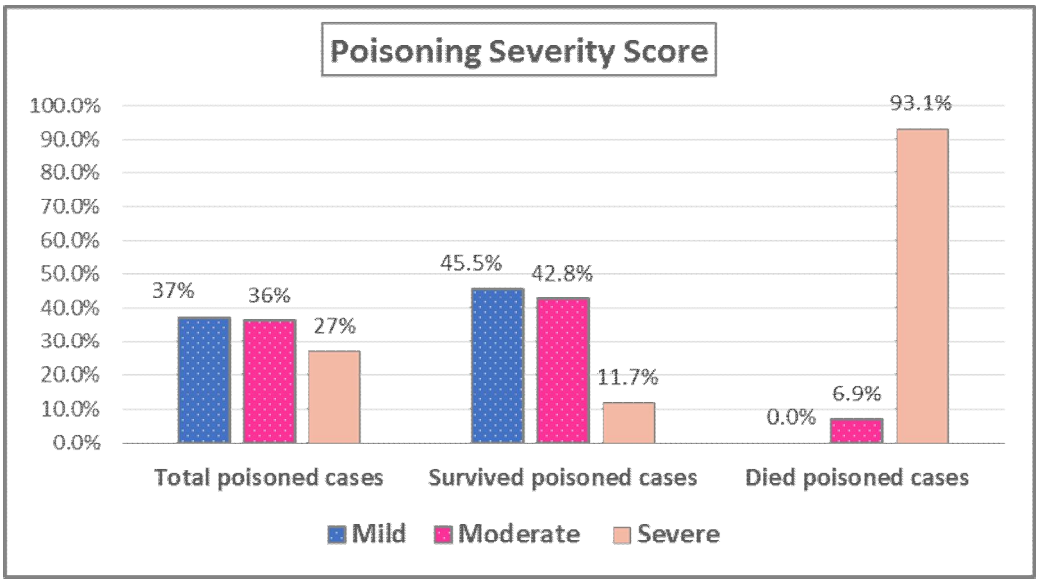
According to the type of poison used in self-poisoning suicides, phosphide was the most widely used substance among dead cases (95.1%) while organophosphorus was most frequently used in survived cases (44.0%) followed by drug overdose (analgesics, theophylline, antipsychotics, tricyclic antidepressants, sedative hypnotics, and digitalis) (32.4%). However, in cases of self-inflicted harm, burn was the most common method used in dead cases (50.0%) followed by railway injuries (25.0%) while in the survivors, the most common method used was cuts (cut throat and cut wrist) (72.9%).Types of injuries varied between contusions, contused and crush wounds, bone fractures and internal hemorrhage in different parts of the body in jumping from height and railway injuries cases, while cut wrist and cut throat in cases harming themselves with cuts and different degrees of burn in burn cases (Table 3).

Table (3): Distribution of the cases according to manner of suicide and outcome (n= 613).

Type of poison	Survived poisoned cases (n=444)	Died poisoned cases (n=102)	Z test	P value
Drug overdose	144 (32.4%)	2 (2.0%)	6.27	<0.000**
Organophosphorus	195 (44.0%)	2 (2.0%)	7.95	<0.000**
Phosphide	89 (20.0%)	97 (95.1%)	14.42	<0.000**
Warfarin	9 (2.0%)	0 (0%)	1.4	0.15
Household	7 (1.6%)	1 (0.9%)	0.45	0.65
Type of trauma	**Survived trauma cases (n=59)**	**Died trauma cases (n=8)**	**Z test**	**P value**
Burn	7 (11.7%)	4 (50.0%)	2.73	0.006*
Cuts (cutthroat, cut wrist)	43 (72.9%)	1 (12.5%)	3.37	0.001*
Jumping from height	3 (5.2%)	1 (12.5%)	0.83	0.406
Railway injuries	4 (6.8%)	2 (25.0%)	1.69	0.091
Hanging	2 (3.4%)	0 (0%)	0.52	0.596

n=number, **highly significant (P value <0.001), *significant (P value <0.05)

According to the poisoning severity score applied on the patients on admission, 37.0% of total cases were mild, 36.0% were moderate, while 27.0% were severe. Mild cases predominated among survivors (45.5%), while severe cases made up the highest percentage of fatalities (93.1%) (Figure 1).



Fig, (1): Distribution of the poison cases according to poisoning severity score and the outcome (n= 546).

Legal classification of injuries in all trauma cases was as follow,46.0% of cases were simple injuries, 42.0% were dangerous and 12.0% of them were fatal. In the survived cases, the injuries were mostly simple (53%) compared to the dead cases, where the injuries were all fatal (Figure 2).

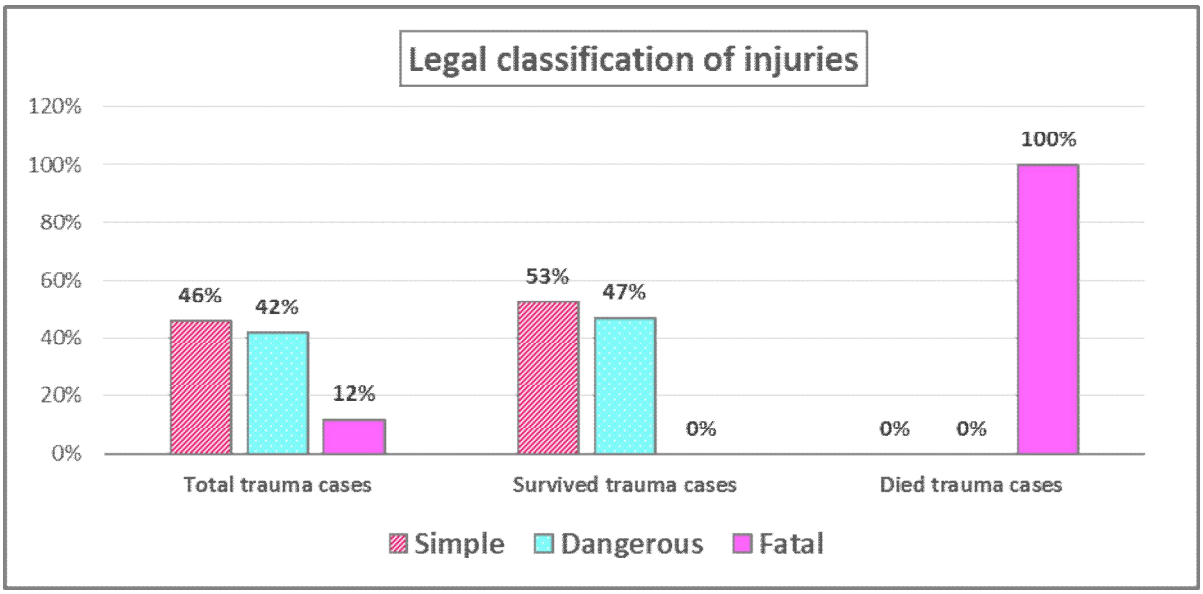


Fig. (2): Distribution of the trauma cases according to legal classification of injuries and the outcome (n= 67).

A very statistically significant association was discovered between the trigger for suicide and gender, with the biggest percentage of boys (49.2%) attempting suicide for school failure, followed by family problems at 27.7%, while family problems was the most common motivation among girls (42.8%) (Table 4).

Table (4): Distribution of suicidal cases in children according to gender and motives (n= 613).

Motives	Boys (n=195)	Girls (n=418)	Z test	P value
Psychological problems (n=33)	15 (7.7%)	18 (4.3%)	1.73	0.08
School failure (n=237)	96 (49.2%)	141 (33.7%)	3.67	<0.000**
Relation failure (n=74)	14 (7.2%)	60 (14.4%)	2.53	0.01*
Family problems (n=233)	54 (27.7%)	179 (42.8%)	3.59	0.000**
Death of dear (n=36)	16 (8.2%)	20 (4.8%)	1.67	0.09

n=number, **highly significant (P value <0.001), *significant (P value <0.05)

In our study, the number of girls trying suicide by self-poisoning increased significantly more than that of boys (P< 0.001). The use of phosphides (37.5%) and drugs (32.1%) were more common among girls. However, boys were more likely to use organophosphorus compounds (56.5%) than girls.

On the other hand, boys outnumbered girls who committed suicide by self-harm (P< 0.001). Girls were more likely to commit suicide by self-cuts (61.5%), followed by burning (30.8%), whereas boys committed suicide by self-cuts (68.3%), railway injuries (12.2%), and jumping from a height (7.4%) (Table 5).

Table (5): Distribution of children suicidal cases according to gender and manner of suicide (n= 613).

Manner of suicide	Boys (n=195)	Girls (n=418)	Z test	P value
Total Poison cases	**(n=154)**	**(n=392)**	**5.36**	**<0.0001****
Drug overdose	20 (13.0%)	126 (32.1%)	4.55	<0.0001**
Organophosphorus	87 (56.5%)	110(28.1%)	6.22	<0.0001**
Phosphide	39 (25.3%)	147(37.5%)	2.70	0.006*
Warfarin	6 (3.9%)	3(0.8%)	2.58	0.009*
Household	2 (1.3%)	6(1.5%)	0.20	0.84
Total trauma cases	**(n=41)**	**(n=26)**	**5.47**	**<0.0001****
Burn	3 (7.4%)	8 (30.8%)	2.52	0.011*
Cuts (cutthroat, cut wrist)	28 (68.3%)	16 (61.5%)	0.56	0.57
Jumping from height	3 (7.4%)	1 (3.8%)	0.58	0.56
Railway injuries	5 (12.2%)	1 (3.8%)	1.16	0.24
Hanging	2 (5.0%)	0 (0%)	1.14	0.25

n=number, **highly significant (P value <0.001), *significant (P value <0.05)

After assessment of the cases using SAFE-T scale, it was found that the majority of cases were of low risk (40.3%) followed by the high-risk cases (36.7%). There was a highly significant difference between the survived and died cases as regard to their risk level with the greatest percentage of high risk among the dead cases (64.5%) and the highest percentage of low risk among the survived cases (45.9%) (Figure 3 and Table 6).

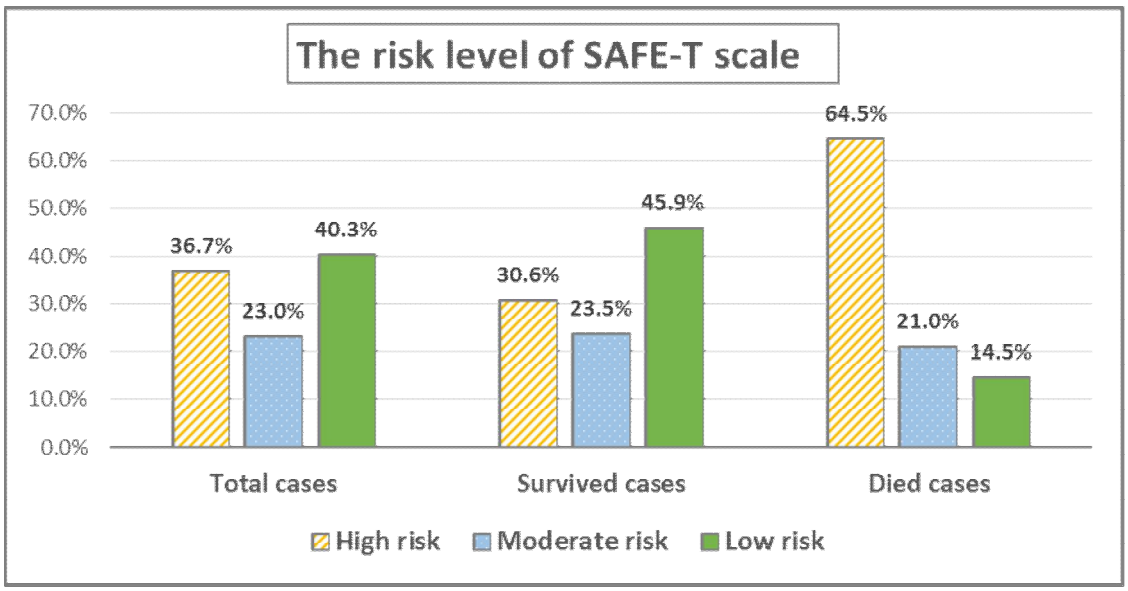


Fig. (3): Distribution of suicides in children according to the risk level of SAFE-T scale and the outcome (n= 613).

Table (6): Distribution of children suicidal cases according to the risk level of SAFE-T scale and outcome (n= 613).

Risk level	Survived cases (n=503)	Died cases (n=110)	Total (n=613)	Z test	Statistical significance
High risk	154 (30.6%)	71 (64.5%)	225 (36.7%)	6.68	<0.000**
Moderate risk	118 (23.5%)	23 (21.0%)	141 (23.0%)	0.57	0.57
Low risk	231 (45.9%)	16 (14.5%)	247 (40.3%)	6.07	<0.000**

n=number, **highly significant (P value <0.001)

Regarding the survived cases, there was a significant relationship between the methods used to attempt suicide and the level of risk of cases according to SAFE-T as we found that among the self-poisoning cases. The use of organophosphorus compounds (60.0%) and phosphides (30.4%) were more prevalent among the high-risk cases. However, self-cuts (cutthroat, cut wrist) were the most common method used in low and moderate risk cases as they represented (92.6% and 84.6% respectively) (Table 7).

Table (7): Distribution of survived cases according to manner of suicide and the level of risk (n=503).

Poison cases (n=444)	Survived cases (n=503)			Chi square & P value
	High risk (n=135)	Moderate risk (n=105)	Low risk (n=204)	
Drug overdose (n=144)	11 (8.1%)	18 (17.1%)	115 (56.4%)	χ^2 = 150.0 p = <0.000**
Organophosphorus (n=195)	81 (60.0%)	36 (34.3%)	78 (38.2%)	
Phosphide (n=89)	41 (30.4%)	43 (40.9%)	5 (2.5%)	
Warfarin (n=9)	2 (1.5%)	5 (4.8%)	2 (0.9%)	
Household (n=7)	0 (0.0%)	3 (2.9%)	4 (2.0%)	
Trauma cases (n=59)	**High risk (n=19)**	**Moderate risk (n=13)**	**Low risk (n=27)**	
Burn (n=7)	6 (31.6%)	0 (0.0%)	1 (3.7%)	χ^2 = 22.96 p = 0.003*
Cuts (cutthroat, cut wrist) (n=43)	7 (36.8%)	11 (84.6%)	25 (92.6%)	
Jumping from height (n=3)	1 (5.3%)	1(7.7%)	1 (3.7%)	
Railway injuries (n=4)	3 (15.8%)	1 (7.7%)	0 (0%)	
Hanging (n=2)	2 (10.5%)	0 (0%)	0 (0%)	

n=number, **highly significant (P value <0.001), *significant (P value <0.05)

Similarly in the dead cases, we found that among the self-poisoning cases, the use of phosphides (95.4%) was the most prevalent method among the high-risk cases and also in low risk (100%). However, burn was the most common method used in high-risk cases of self-trauma (50%) (Table 8).

Table (8): Distribution of died cases according to manner of suicide and the level of risk (n=110).

Poison cases (n=102)	Died cases (110) High risk (n=65)	Moderate risk (n=21)	Low risk (n=16)
Drug overdose (n=2)	1 (1.5%)	1 (4.8%)	0 (0.0%)
Organophosphorus (n=2)	1 (1.5%)	1 (4.8%)	0 (0.0%)
Phosphide (n=97)	62 (95.4%)	19 (90.5%)	16 (100.0%)
Warfarin (n=0)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Household (n=1)	1 (1.5%)	0 (0.0%)	0 (0.0%)
Trauma cases (8)	**High risk (n=6)**	**Moderate risk (n=2)**	**Low risk (n=0)**
Burn (n=4)	3 (50.0%)	1 (50.0%)	0 (0.0%)
Cuts (cutthroat, cut wrist) (n=1)	1 (16.7%)	0 (0.0%)	0 (0.0%)
Jumping from height (n=1)	1 (16.7%)	0 (0.0%)	0 (0.0%)
Railway injuries (n=2)	1 (16.7%)	1 (50.0%)	0 (0%)
Hanging (n=0)	0 (0.0%)	0 (0%)	0 (0%)

n=number

Binary logistic regression was performed to determine the factors associated with mortality. It revealed that suicidal mortality was predicted among boys (OR = 3.60, CI 95%: 2.19–9.01), those with history of chronic diseases, positive history of child abuse and history of drug abuse (OR = 1.94, CI 95%: 1.59–6.95), (OR = 2.89, CI 95%: 1.72–8.79) and (OR = 4.76, CI 95%: 3.61–11.98) respectively. Also, presence of family troubles (OR =3.18, CI 95%:2.22–9.91), presence of previous attempts of suicide (OR =6.76, CI 95%:2.85–12.35), time of hospital arrival more than 2 hours (OR =8.76, CI 95%:5.00–20.64) and the use of phosphide (OR =15.87, CI 95%:9.53–50.76) were found to be independent predictors of mortality (Table 9).

Table (9): Binary logistic regression model for the risk factors of suicide deaths in children (n=613).

Independent factors	P value	Odds ratio	95% CI Lower	95% CI Upper
Sex: Boys vs girls[#]	< 0.001**	3.601	2.195	9.011
Marital status Divorced Vs married[#]	0.55	1.43	0.431	4.724
History of chronic diseases Present Vs absent[#]	0.032*	1.94	1.593	6.95
History of child abuse Present Vs absent[#]	0.009*	2.89	1.72	8.79
History of drug abuse Present Vs absent[#]	0.001*	4.76	3.618	11.984
History of School failure Present Vs absent[#]	0.491	1.83	0.771	1.91
History of Relation failure Present Vs absent[#]	0.769	1.02	0.87	1.97
History of Family problems Present Vs absent[#]	0.008*	3.18	2.22	9.91
Previous attempts of suicide ≥ 1 Vs zero attempts[#]	<0.001**	6.769	2.85	12.351
Time of hospital arrival ≥ 2 hours Vs within 2 hours[#]	<0.001**	8.769	5.004	20.649
Type of poison Phosphide Vs other poisons[#]	<0.001**	15.87	9.53	50.76
Type of trauma Burn Vs other types[#]	0.527	1.45	1.79	3.26

[#]Reference group, **highly significant (P value <0.001), *significant (P value <0.05)

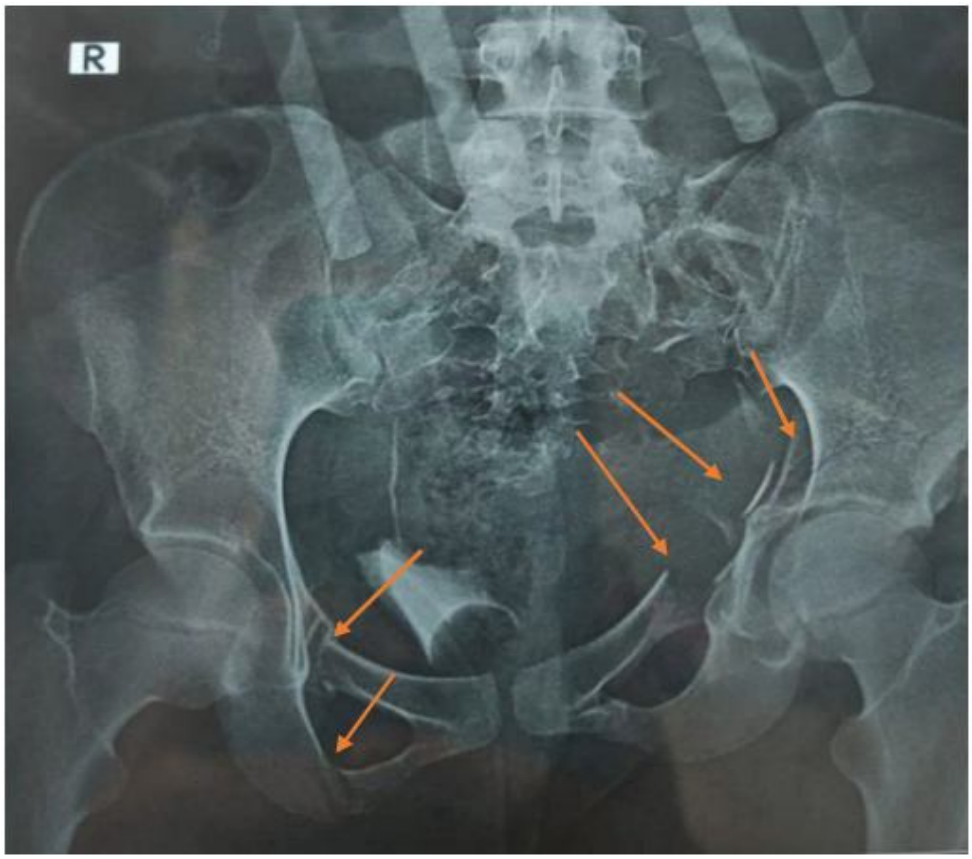


Fig. (4): X-ray film of a girl 16.5 years old, showing multiple fractures (arrows) in the pelvis as a result of jumping from 2nd floor in an attempt of suicide due to school failure.

Discussion:

Despite suicide in Egypt is condemned by the Islamic law or doctrine and is considered to be a criminal act onto the self, suicide is still a widespread phenomenon in the Egyptian community. The 2019 suicide rate in Egypt was 3%. The suicide mortality rate is the amount of suicide fatalities per 100,000 people in a given year (World Bank, 2022).

This work studied suicide in children aged below 18 years old. A total of 613 children were admitted as suicidal self-poisoning and self-trauma throughout the period of the study. Children and teenagers are more vulnerable to commit suicide because they have insufficient experience, unstable emotions, and are being greatly affected by the stressful environment outside (Spiller et al. 2020). WHO stated that suicide was the fourth leading cause of death among 15-29 year-olds globally in 2019 (WHO, 2021). The current work focused onto comparison between survived (attempted suicide) and dead (successful suicide) cases as regard different aspects to detect risk factors of suicide mortality in children.

The most dominant age group in this study was older children aged 14-18 years who over numbered younger children (7 - < 14). Teenage age is between drastic adjustments to behavior and thought. They experience several demands at once, including those from school, home، both parents and

society. Additionally, teens lack the experiences and awareness of real-life circumstances. Consequently, most suicide attempts than at any other age, may be created in adolescence (Shah and Punjani, 2014).

As regard **gender** we found that girls outnumbered boys in both survived and dead groups. Egypt is one of the developing countries in which females are subjected to more tight restrictions than males. Females' chances of education are generally less than males especially in rural areas. Moreover, the increasing magnitude of the problem of divorce – especially if early before age of 18 years, family troubles that are often resolved in favor of men, these issues collectively led to occurrence of suicide more frequently in females than males. This was in accordance with Pires et al. (2012) who stated predominance of women in cases of attempted suicide.

However, in the current work boys were found as a risk factor for suicide mortality in children as dead cases in them were significantly higher than survived cases, and this was reversed in girls. A possible explanation is that females choose methods that are less lethal than those used by men and this was supported by Tsirigotis et al. (2011).

Regarding **previous suicide attempts**, more than half of deaths had tried suicide one or more times before. This indicates that previous suicide attempts are risk factor for recommitting subsequent more serious and more violent suicide trials. The current results were similar to Dursun and İbrahim (2013) who found that in the survey conducted among high school adolescents, subjects with one suicide attempt were found to have 15 time increased risk for a later attempt .

The current results also revealed that **delay time** is an important risk factor for mortality. The time gap between exposure and the beginning of therapy has a significant impact on its effectiveness and, consequently, the prognosis of the patient. Additionally, delaying treatment will result in the development of more serious problems and complications which increase probability of death. The necessity for mechanical ventilation and admission to the intensive care unit (ICU) are linearly and positively correlated with lag time, according to Ahmed et al. (2014) 's research.

On asking patients about comorbidities that could represent risk factors for suicide mortalities, it was found that history of chronic diseases (DM, cardiac diseases, autoimmune diseases and respiratory diseases), child abuse and drug abuse constituted respectable risk factors. Chronic illnesses are significantly associated with more bodily pain, less vitality, mental and general health and subsequent more poor quality of life (Ahmadi et al., 2013). Current findings agreed with Rodway et al. (2016) whose study was on suicide in children and young people in England, they found that more than third of cases had a physical health problem, usually long-standing.

History of **child abuse** was positive in both dead and survived cases with high statistical significance. Sexual, physical, and emotional abuse of children as well as neglect are all included under the general words "child abuse" or "maltreatment". Child maltreatment is one early life stressor that has been linked to adult psychopathological outcomes (Wong et al., 2020). Similar results were noted by Afifi, et al. (2016), Martin, et al. (2016) and Rodway et al. (2016).

Present study revealed that high percent of dead cases had a positive history of drug abuse. Suicidal behavior has been highly associated with substance use in children and adolescents (Vijayakumar et al., 2011). Rodway et al. (2016) stated that 21% of study subjects had taken illicit drugs months prior to

suicide, the most frequent was cannabis. Dursun and İbrahim (2013) also, concluded that the odds of suicide attempt nearly double for every extra substance used.

Family troubles and school failure were the main motives for suicide in our study population with significant statistical difference between survived and dead cases. Familial conflicts had the upper hand in dead group, where school failure represented the main reason in survivors. Kasemy et al. (2022) found that family conflicts constituted the main motive for attempting suicide while Sweilum and Kandeel (2016) found that educational motive was significantly the most prevalent one at 7-18 years age group (age of schooling). El-Farouny and Helmy (2021) and Taha et al. (2011) stated similar results.

Family conflicts were also, found to be the main motive for girls, compared to school failure in boys. Children being girls or boys are highly affected by surrounding environments especially home and school, both are supposed to be the safest for them. Any disturbance in one or both represent a great threat to children who may rush towards suicide to get rid of the annoying threats.

In the current study, suicides by poisoning were more common than those using violent methods. Moreover, poisoning was more dominant in committing successful suicide, with organophosphorus insecticides being the most common used poison. The widespread use of organophosphorus pesticides is due to the agricultural nature of Menoufia Governorate whose most population work in agriculture especially men. organophosphorus pesticides are cheap, available and don't need special procedures for trading. Despite its more prevalence, organophosphorus pesticides were not the most lethal. The most lethal was poisoning by aluminum (ALP) and zinc phosphide. Toxicity of ALP is due to phosphine gas. Till now, there is no specific antidote for ALP poisoning and management is mainly symptomatic (Bhalla, et al., 2017). Hassan et al. (2015), Sweilum and Kandeel(2016) and El-Farouny and Helmy (2021) reported similar results.

Among cases died by violent methods; fatalities due to burn was the highest. Moreover, deaths due to self-burn was highest among girls than boys with a statistically significant difference. Females find fire an easily accessible weapon at home to terminate their lives. Similar results were stated by Abdel Moneim et al. (2011) where they found that burning was the second widely used method in females and fourth in males after self-poisoning who occupied the first position. On the other hand, Taha et al. (2011) and Katageri and Hanumantha(2012) stated that burning was the most common method of suicide in both sexes. This difference can be due to different sociodemographic between studies where ours focused on children only who rush towards less violent and less painful methods as poisoning.

The poisoning severity score (Persson et al., 1998) was used to categorize the cases into mild cases, moderate and severe on admission and severe cases made up the highest percentage of fatalities. These results differed from Salah Eldin and Azim (2018) who documented that majority of cases were mild (>70%), while severe cases constituted 6.8%. Difference can be explained by that drug were the main used substances in their study while ALP were the comments in ours with its proved high lethality.

Depending on damage amount, injuries were classified using legal classification of injuries into simple, dangerous and fatal injuries (Krishan, 2011). Dangerous and fatal injuries exceeded simple ones, and this may be owing to male dominance in this type of suicide, males usually commit while females usually attempt and threat.

According to binary logistic regression, boys, history of child abuse, chronic diseases, and drug abuse, family problems, history of previous suicidal attempts, delayed hospital arrival and phosphide poisoning were significantly the risk factors for suicide deaths in children. ALP poisoning was the highest predictor and most risky for mortalities. Total mortality in cases of ALP poisoning ranges between 70–100% and more than two tablets increase the risk of death, and none of the patients who had taken more than three tablets lived (Meena et al., 2015).

These results mostly agreed with Kasemy et al. (2022) who studied cases of attempted and successful suicide by self-poisoning in Egypt. They found that females, students, individuals aged less than 25 years old, those living in urban areas, those suffering from family disputes, or psychological disorders had increased odds of death and were significantly at risk of death from suicide by self-poisoning more than others. Also, Doshi et al. (2020) found that men and those with higher economic levels were at highest risk for suicide mortality but more common in those aged 45–59 years. The disparity between the two study populations' clinical and demographic traits may be the cause of this discrepancy.

The SAFE-T is a scale used to assess risk factors and protective factors of the patients, suicidal thoughts, plans, intent, and behaviors to help physicians in determination of patients' disposition and discharge (Brodsky et al., 2018).

As long as suicidal ideas and planning or suicidal behavior, attempts are the first steps come in mind during psychiatric assessment of a case of suicide, thus SAFE-T scale was suitable to cover all the items required either from history or mental examination to differentiate between high, moderate and low risk patients. In addition, SAFE-T depends on taking detailed history from the patient or their relatives which was suitable for the cases selected for this study.

After assessment of the cases using SAFE-T, patients were classified into high, moderate, and low risk. It was found that there was a highly significant difference between the survived and died cases as regard to their risk level with the greatest percentage of high risk among the dead cases and the highest percentage of low risk among the survived cases. Mullinax et al. (2018) and Simon et al. (2007) agreed with these results. Increasing the risk level of suicide means that there are intense thoughts, planning and impulsive behavior and almost no protective factors, hence making the patient more vulnerable to commit suicide with more lethal methods.

The current results showed a significant relationship between the methods used to commit suicide and the risk level of cases. Phosphide was the most commonly used substance to commit successful suicide in high-risk children, while both organophosphorus and phosphide compounds were used by high-risk survivors. This matches with the findings of Parrón et al. (1996) and Freire and Koifman (2013) who described that pesticide is the most dangerous way of suicide as long as it's available in developing countries, thus increasing risk of suicide and using it will lead to lethality either there are protective factors or not or the presence of the intent or not.

At the same time, it was observed that phosphides were the used poisons in low-risk fatalities, indicating that death is unavoidable with these highly lethal compounds even if the person has strong protective factors and has no intention to die.

The study also, showed that cuts are higher in moderate and low risk suicides which agreed with Nock et al. (2006), although low risk have modifiable risk factors

they could chose trauma as a mean of suicide, they don't mean actually to die and usually don't repeat the attempt. On the other hand there was high risk significance with the cases of burn in self trauma fatalities which consists with Edelman (2007), Edwards et al. (2007) and Lari, et al. (2007), who stated that burn as a way to commit suicide is common among certain socioeconomic levels as the patients know that this usually leads to death and according to the scale these patients have no protective factors and have many risk factors as dear loss, financial problems, severe depression which makes them choose this lethal method.

One of the points of strength of this study is that it focused on a certain age group (children) which is one of the most valuable groups because of their impulsive nature, also they need more constructive and effective ways of dealing as they are the future of any nation. The study included both self-poisoning and self-harm suicides in children and focused on deaths pattern and risk factors from forensic and toxicology, psychiatric and public health point of view. Risk and protective factors and suicidality were assessed through the Suicide Assessment Five-Step Evaluation and Triage (SAFE-T) for more effective assessment and proper interventions.

However, it is considered a limitation that it included cases arrived at Menoufia University hospital during a certain period with no available data to correlate with other hospitals in the governorate to give the exact prevalence of the problem in Menoufia. Also, it is limited to hospitalization cases and no data about deaths occurred outside. Uncooperative patients or their guardians, unclear history and misreporting of the injuries or poisonings regarding being accidental or deliberately inflicted might cause underestimation of the real numbers and extent of suicide deaths in children.

Conclusion:

Boys, chronic diseases, history of child abuse, history of drug abuse, presence of family troubles, previous attempts of suicide, delayed arrival to hospital and the use of phosphides were found to be risk factors for suicide deaths in children. There was significant relationship between risk level (according to SAFE-T) and outcome and manner of suicides in children where phosphides were confirmed to be the commonest among high-risk and low risk suicide deaths. Suicide is a serious emergency case should be deliberately investigated and take in consideration the surroundings of the patient and availability of the methods of suicides.

Recommendations:

Prevention of children suicides is mandatory and one of the main priorities of any nation, as with each suicide a life, and contributions made to society are lost. Therefore, more effective policies should be directed to control risk factors as child abuse (e.g., Physical, bullying) and drug abuse, also to restrict use of lethal pesticides as phosphides. Limiting access to the most popular suicide methods could be an appropriate approach to prevent suicide mortalities in children.

Proper psychiatric care, school-based prevention programs, and family relationship strengthening are clearly very important preventative measures. Hence educational workshops and seminars should be conducted to raise the awareness of all personnel who are usually in contact with children like parents, teachers, doctors, and nurses.

Further studies are needed to be done in different Egyptian districts on people of all ages to assess pattern of suicide deaths in Egypt with application of SAFE-T on all

suicides for better assessment and determination of patients' disposition and discharge.

Also, it is needed to use SAFE-T as an assessment tool for determining different methods of management efficacy and therefore future studies are recommended to include different lines of management of high-risk cases who are saved and cured and reassess them after each line of treatment to reevaluate their risk of suicide.

Conflict of Interest:

The authors of this study have declared that there is no conflict of interest.

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نمط وعوامل الخطورة للوفيات الناتجة عن الانتحار فى الأطفال من الحالات الواردة الى مستشفيات جامعة المنوفية وتحليلها من خلال تقييم الانتحار ذو الخمس خطوات

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[3] قسم النفسية - كلية الطب - جامعة المنوفية

تعد الوفيات الناجمة عن الانتحار عن طريق التسمم الذاتي أو إيذاء النفس بين الأطفال مشكلة صحية كبيرة في جميع أنحاء العالم والتي تحتاج إلى تقييم وتدخلات مناسبة. ومن ثم أجريت الدراسة الحالية لإعطاء لمحة عامة عن نمط وعوامل الخطورة لوفيات الانتحار لدى الأطفال من بين الحالات التي وصلت إلى مستشفى جامعة المنوفية ، مع تحليل نفسي لمثل هذه الحالات من خلال تقييم الانتحار ذو الخمس خطوات (SAFE-T).

كانت هذه دراسة مقطعية تحليلية اشتملت على جميع حالات الانتحار التي تمت بواسطة التسمم و الإصابات والتي حضرت إلى مركز علاج السموم أو قسم الطوارئ في مستشفى جامعة المنوفية على مدى عام ونصف. تم جمع البيانات من خلال استبيان مصمم مسبقًا والذي تضمن المعلومات الديموغرافية وعوامل الخطورة لمحاولة الانتحار. تم تقييم شدة حالات التسمم ، واستخدام التصنيف القانوني للإصابات لتصنيف شدة الإصابات. تم جمع البيانات السريرية النفسية من خلال "SAFE-T".

بلغ عدد الحالات ٦١٣ حالة ؛ وتم تصنيفهم حسب نتيجتهم على عدد الحالات التى شفيت (٥٠٣) والوفيات (١١٠). من بين المرضى ، (٨٢,٧٪) كانوا في الفئة العمرية ١٤-١٨ سنة مع غلبة للإناث (٦٨,٢٪) ، على الرغم من وفاة الذكور بمعدل أعلى من الإناث. كانت المشاكل الأسرية والفشل المدرسي هي الدوافع الرئيسية للانتحار. وكان الفوسفيد أكثر المواد المستخدمة على نطاق واسع بين حالات الوفاة (٩٥,١٪). وبحسب مقياس شدة السموم فإن ٣٧,٠٪ من الحالات كانت خفيفة و ٣٦,٠٪ متوسطة و ٢٧,٠٪ كانت شديدة. فاق عدد الذكور عدد الإناث الذين انتحروا بإيذاء النفس ٦٨,٣٪ بإصابات النفس و ١٢,٢٪ بإصابات السكك الحديدية. كانت هناك علاقة ذات دلالة إحصائية بين مستوى الخطر (وفقا ل SAFE-T) ونتائج وطريقة الانتحار لدى الأطفال في مستشفى جامعة المنوفية

وجد أن الذكور ، أولئك الذين لديهم تاريخ من الأمراض المزمنة ، وتاريخ مسبق بإساءة استخدام الأطفال وتعاطي المخدرات ، ووجود مشاكل عائلية ، ومحاولات سابقة للانتحار ، ووقت وصول المستشفى لأكثر من ساعتين واستخدام الفوسفيد لتكون تنبئًا مستقلاً بالوفاة في انتحار الأطفال. ووجد أن فوسفيد الزنك هو الأكثر فتكًا.. ان الانتحار حالة طارئة خطيرة يجب التحقيق فيها بجد مع مراعاة ظروف المريض ومدى توافر طرق الانتحارحوله.

منع انتحار الأطفال أمر لا بد منه وإحدى الأولويات الرئيسية لأي أمة ، كما هو الحال مع كل انتحار ، تضيع الحياة والموهبة والإبداع والمساهمات المقدمة للمجتمع. لذلك ، يجب توجيه سياسات أكثر فعالية للسيطرة على عوامل الخطر مثل إساءة معاملة الأطفال ، وتعاطي المخدرات ، وكذلك لتقييد استخدام المبيدات الحشرية القاتلة وخاصة الفوسفيد. قد يكون الحد من الوصول إلى طرق الانتحار الأكثر شيوعًا نهجًا مناسبًا لمنع وفيات الانتحار عند الأطفال.