Spectrum of Unnatural Deaths among the Adolescents: An Autopsy Based Study

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Abstract:

Background- *During transition from childhood to adulthood people is exposed to various hazards having potentiality to lead to unnatural deaths by distorting physical, mental and social wellbeing. Studying pattern of unnatural deaths helps stakeholders to formulate policies for prevention of loss of important human resource.*

Objective- *to study the spectrum of unnatural deaths among adolescents.*

Methodology- *cross-sectional descriptive study in the mortuary of Bankura Sammilani Medical College of West Bengal, India. Data from January to December, 2014 were collected from autopsy reports, police inquest reports, copy of death certificates etc. using predesigned format.*

Results- *Majority (55.1%) of deceased were female; 35.71 percent belonged to younger adolescents (10-14 years). Average age was 16.03±2.49 years showing no variation across gender and castes. Majority (43 percent) of unnatural deaths was contributed by accidents including RTA, fall from height, snake bite, lightning, drowning. The accidents shared around half of total unnatural deaths. Poisoning, hanging including stragulation/throttling and thermal burns ranked next after accident contributing 22 percent, 19 percent and 10 percent, respectively. Accidental deaths were statistically higher in younger adolescents [71.43% vs 36.51%, χ^2=10.98, p=0.000 at df1, OR=4.35(1.63-11.80)] and males. Individuals of higher age were shown more prone to suicide [mean±sd=17.91±1.16 vs 14.32±2.17, t=9.825 & p=0.000 at df 93] than accidents. Females were found less vulnerable to accidents than suicide. Burns cases were found to survive significantly longer after the event.*

Conclusion- *Behaviour change communication of parents, teachers, career guides, office masters, law keepers etc. for fostering congenial environment for upbringings of adolescents is needed to prevent unnatural deaths.*

Keynotes: *adolescents, unnatural death, accidents, rapidly fatal*

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I. Introduction

The World Health Organisation (WHO) defines an adolescent as a person between the ages of 10 and 19 years old. Around 1 in every 6 persons in the world is an adolescent: that is 1.2 billion people are aged 10 to 19.[1] Adolescents (10-19 years) constitute about one fourth (21.4% or 243 million) of India's population and young people (10-24 years) about one third (or 350 million) of the population.[2]

Youth - the critical phase of life is a period of major physical, physiological, psychological, and behavioural changes with changing patterns of social interactions and relationships.[3] During this turbulent phase of life the young individuals are exposed to various needs, demands, challenge, failure, conflicts, problems, uncertainty of career etc. leading to be the prey of stress and addictions. The NFHS-3 survey showed that 1 per cent women and 11 per cent men aged 15-19 year and 1.4 per cent women and 28.8 per cent men aged 20-24 year consumed alcohol.[4] Around 43 per cent adolescents indulge in substances abuse.[5] Many of them fail to cope with the growing stress and develop psychiatric illnesses.The prevalence of overall psychiatric morbidity

(depression, conduct disorder, social anxiety, and panic disorder) among adolescents varied from 12 to 16.5 per cent.[6, 7]

Severe depression and conflicts may lead to deliberate self-harm (DSH) like suicide. In India, nearly 1, 36,000 persons voluntarily ended their lives in a suicidal act as per official reports in 2011.[8] About 40 per cent of suicides in India are committed by persons below the age of 30years.[9]

Out of their enthusiasm, curiosity and lack of experience adolescents indulge in risky life styles. Road traffic injuries (1, 85,000 deaths; 29 per cent of all unintentional injury deaths) are the leading cause of unintentional injury mortality in India.[10]

An average of 565 adolescents and young adults between the ages of 10 and 29 years die each day as a result of interpersonal violence across the world.[11] Studies from India reported that 19 to 42.8 per cent of adolescent females had experienced domestic violence.[12,13]

Even if the distribution of skills and autonomy varies within the age groups, adolescents will still grow up and become fundamental contributors to development in any country. For this reason alone, it is necessary to investigate the levels and causes of adolescent mortality since it has a direct impact on the size and health of the future population.[14] That's why the present study was contemplated to describe the state of the art about the unnatural deaths among adolescents.

Objective:
o   To describe the pattern of unnatural deaths among the deceased adolescents
o   To find out the correlates of unnatural deaths, if any

II.   Materials And Method

The present research was a descriptive cross-sectional study undertaken at the mortuary of Bankura Sammilani Medical College and Hospital (BSMC&H), Bankura, West Bengal, India during the period of January to December 2014. All the cases of unnatural deaths, which occurred during the course of treatment at BSMC& H were subjected to medico-legal autopsy during the study period were included in study.The study also considered all unnatural deaths from the adjacent districts like Bardhhaman, Purulia etc. brought to the mortuary of BSMC&H for the purpose of medicolegal autopsy. However, unknown, severely decomposed and exhumed bodies were not considered. After obtaining necessary approval of the Ethics Committee retrospectively collected 2ndary data were gathered from the postmortem report, police inquest reports, copy of death certificates etc. of each deceased using a predesigned format.

Data were analysed using M S excel and SPSS-16 free version. Various statistical methods like charts, tables etc. were used for data display. Results were described by calculating mean, standard deviation,median, proportion etc. and independent't' test, chi-square/Fisher exact test, Odds ratio (OR) with its 95 percent confidence interval (CI) etc. were used to explore association between variables. P value of ≤0.05 at 5% level of accuracy was considered significant.
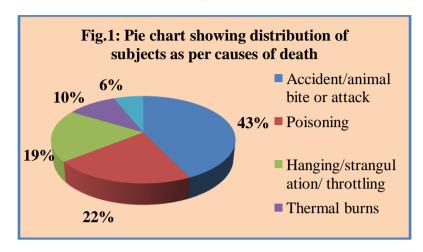
Operational definition: For this study some definitions were adopted:
▪   Adolescents were classified as follows-
✓   'Younger'- within the age range of 10-14 years
✓   'Late/older'- in the age group 15-19 years.[14]
▪   The causes of unnatural deaths were classified as follows:
o   'Accidental deaths'-deaths due to accidents like RTA, snake bite, drowning, fall from height, lightning etc.
o   Other deaths'- deaths from burns, hanging, poisoning.
o   'Rapidly fatal cause'- Where victims died of on the spot or before reaching health facility
o   'Not rapidly fatal cause'- Where deceased was brought to health facility alive.
➢   'Suicide'- death due to deliberate self harm to end one's life[15]
➢   'Homicide'-death caused by the foul play by others
➢   'Accident'-death due to negligence by the person himself or by others without any criminal intention.[15]
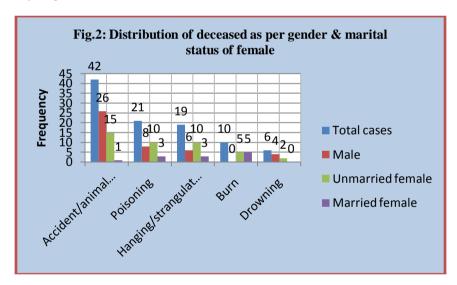
III.   Results

Out of the 122 cases attended for medicolegal autopsy during the reference period 98 i.e. 80.33 percent were included in the study as per the inclusion criteria. Analysis revealed that majority (55.10 percent) of study subjects was female. M: F was noted to be 1: 1.23. Slightly higher than one third (35.71 percent) belonged to younger adolescents group and analysis revealed that there was no significant difference between younger and older adolescents in respect of gender (χ^2=0.115, p>0.05) and caste (χ^2=0.733, p>0.05) distribution.Average age was estimated to be 16.03±2.49 years with median of 17 and range 10-19 years. The age was not found to vary across the gender [mean±sd=16.44±2.48 vs 15.69±2.47, t=1.508 & p=0.135 at df 96] and castes [mean±sd=16.15±2.39 vs 15.60±2.79 between general caste vs backward caste, t=0.941 & p=0.349 at df 96].

Only 6.12 percent were reported to be urban residents, around 96 percent (95.92%) belonged to Hindu religion out of which the lion's share (72.63 percent) were from general caste and rest were from backward classes. Out of the 54 female about one-fifth (22.22%) were reported to be married, however all males were unmarried.

Fig.1: Pie chart showing distribution of subjects as per causes of death

Majority (43 percent) of the unnatural deaths was contributed by accidents including RTA, fall from a height, snake bite, lightning, electrocution, and one case of animal attack. If the drowning is considered as accident then the sharing would be around fifty percent. Poisoning, hanging including stragulation/throttling and thermal burns ranked next after accident contributing 22 percent, 19 percent and 10 percent of all unnatural deaths, respectively [Fig.1].
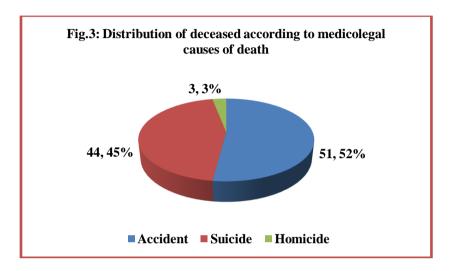

Fig.2: Distribution of deceased as per gender & marital status of female

Out of 44 deaths among males 59.1%, 18.18 %, 13.63% and 9.1 % were contributed by accidents, poisoning, hanging and drowning, respectively.The respective figures among female were 29.63%, 24.1%, 24.1%, 18.52 and 3.7 %, respectively [Fig.2].

All (100.0%) burns, 68.42% hanging, 61.9% poisoning cases were females in contrast to 61.9% accidents and 66.67% drowning cases were males.

Out of 10 thermal burns victims fifty percent cases were married. The proportion of married female victims was higher in burns (50.0%) compared to poisoning (23.1%), hanging (23.1%), accident (6.25%) and drowning (0), respectively. Higher proportion of married women died of the methods like poisoning, thermal burns and hanging which are easily accessible at household level compared to accidental death including drowning (30.56% versus 5.56%), however, the difference was not found to be statistically significant [p=0.043 (2 tailed Fisher exact test), OR=7.48(0.84-169.42)].Fifty percent of accidents, two third of drowning cases belonged to younger adolescent whereas 90 percent thermal burns, 84.21 percent of hanging, and 71.43 percent of poisoning victims belonged to late/older adolescent group. Analysis after categorizing deaths into 'accidental group' including accidents & drowning and 'other group' containing poisoning, thermal burns and hanging revealed that accidental causes of death was statistically higher in younger adolescent [71.43% vs 36.51%,

χ^2=10.98, p=0.000 at df1, OR=4.35(1.63-11.80)] and male gender [68.18% vs 33.33%, χ^2=11.78,p=0.000 at df1, OR=4.29(1.69-11.03)]. However, it was not so across the castes.

The distribution of causes of death across four main seasons namely Summer, Rainy season, Autumn, and Winter showed that 23.47%, 36.73%,12.24% and 27.55% of unnatural deaths happened in Summer, Rainy season, Autumn and Winter, respectively. Majority (47.62%) of the accidents took place in Rainy season. Fifty percent of drowning also happened in Rainy season. More than half (52.63%) of the hanging, 60 percent of thermal burns occurred during Winter. Around 43 percent poisoning found to happen in Autumn. However, significant statistical difference between seasons couldn't be explored because of small sample size of individual groups.

Fig.3: Distribution of deceased according to medicolegal causes of death

According to the medicolegal classification more than half of the cases were revealed to be accidental in nature and closely followed by suicide (45%) [Fig. 3].

Table-1: Distribution of deceased according to medicolegal classification of deaths (n=95*)

Attributes		Accidental No. (%)	Suicidal No. (%)	χ^2	P at df 1	OR (95% CI)
Gender	Male	19(37.25)	22(50.0)	1.564	0.211	1.684(0.742-3.822)
	Female	32(62.75)	22(50.0)			
Age category	Younger	33(64.71)	2(4.55)	**36.741**	**0.0000**	**38.5(8.334-177.865)**
	Late adolescent	18(35.29)	42(93.45)			
Caste	General	14(27.45)	12(27.27)	0.000	0.984	1.009(0.408-2.493)
	Backward	37(72.55)	32(72.73)			
Death category	Rapidly fatal	37(72.55)	27(61.36)	1.344	0.246	1.664(0.701-3.948)
	Not rapidly fatal	14(27.45)	17(38.64)			

*Three cases of homicide were dropped from this analysis because of small sample size.

Distribution of medicolegal causes was shown to have significant difference across the age categories. It reinforced the distribution pattern in relation to mode of unnatural death i.e. the younger age group was revealed to be significantly more vulnerable towards accidental death [Table-1] which was once again strengthened by comparing the age between accidental and suicidal victims showing that the individuals of relatively higher age group committed suicide [mean±sd=17.91±1.16 vs 14.32±2.17, t=9.825 & p=0.000 at df 93].

Table-2: Distribution of deceased as per their cause of death and status while brought to health facility [N=98].

Cause/mode of death	Brought/spot death No. (%)	Alive at presentation No. (%)	Total No. (%)	P (Fisher exact test)	OR (95% CI)
Thermal burns	1(10.0)	9(90.0)	10(100.0)	*	*
Poisoning	4(19.05)	17(80.95)	21(100.0)	1.00	2.12(0.17-57.80)
Accident	20(47.62)	22(52.38)	42(100.0)	0.029	8.18(0.90-187.98)
Hanging/throttling	18(94.74)	1(5.26)	19(100.0)	**0.0000**	162.0(6.78-23820.02)
Drowning	6(100.0)	0	6(100.0)	**0.0000**	NA
Total	49(50.9)	49(50.0)	98(100)	----------	----------

*Reference group, NA=OR not applicable because of '0' in one cell.

Lowest proportion of victims of thermal burns was found to die rapidly i.e. instantaneously on the spot or before reaching health facility and it was significantly higher in hanging and drowning [Table-2]. Based on the rapidity of fatal outcome two groups were created namely 'rapidly fatal' & 'not rapidly fatal' by clubbing drowning, hanging & accidents together in one go and thermal burns & poisoning in other hand.

Statistically, it was revealed that the proportion of early/rapid fatality i.e. spot death/brought death was significantly higher in the first group [χ^2=20.81, p=0.0000 at df 1 with OR=9.95 (3.07-34.32)]. According to this grouping slightly more than two third (68.37 percent) cases fell into the category of 'rapidly fatal'. Analysis reflected that the distribution of 'rapidly fatal'cause of death didn't vary across the castes (χ^2=0.763, p=0.382 at df1), and age category (χ^2=3.407, p=0.065 at df 1). However, mean age was estimated to be significantly low among the 'rapidly fatal' group (mean±sd 15.61±2.69 vs 16.90±1.7, t=2.431, p=0.017 at df 96). It was also found that the distribution of 'rapidly fatal'cause had variation across the gender [χ^2=6.680, p=0.010 at df 1; OR=0.300 (0.117-0.764)] indicating lower risk of accident among the female at the cost of higher risk of suicide among them compared to their male counterpart. The difference in the proportions of rapidly fatal cause of death was also found statistically insignificant between the married and unmarried group of women [χ^2=3.657, p=0.056 at df1; OR=3.6(0.928-13.971)].

Table-3: Distribution of deceased treated at health facility as per their duration of survival (n=48)

Cause of death	Hours alive at hospital [mean±sd]	Independent 't', df, p	F(ANOVA), p at df 2
Accident[n_1=22]	18.14±28.06	*	**24.41,0.000**
Poisoning[n_3=17]	28.47±28.97	1.124,37,0.268	
Thermal burns[n_2=9]	198.0±149.27	**5.546,29,0.000**	
Total@	55.52±96.11	--------------	--------------

* =reference group having lowest survival time, @=one case of hanging lived for 2 hours was ignored due to small sample size; t=4.602, P=0.000 at df 24 when 'poisoning' was compared with 'thermal burn'.

Table-4: The result of Kaplan Meier analysis of hours lived by the victims after the event.

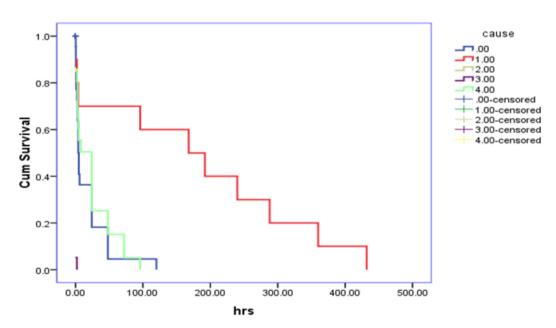| Overall Comparisons			
	Chi-Square	df	Sig.
Log Rank (Mantel-Cox)	89.223	4	.000
Test of equality of survival distributions for the different levels of cause.			

Survival Functions

Figure 4: Survival plot in Kaplan-Meier analysis considering death over time as outcome of interest [0=accident, 1=burn, 2=drowning, 3=hanging, 4=poisoning]

Analysis of the time interval for which the deceased survived after the events showed that it was significantly higher among the victims of thermal burns compared to accidents and poisoning cases with an average of 198 hours (Table-3 & Fig.4). However, though the average hours the deceased lived after the event was found to be higher in suicidal victims but it wasn't statistically significant [mean±sd=37.15±95.98 vs 20.14±45.72, t=1.127 & p=0.263 at df 93] when compared with that of the victims of accidents.

IV.   Discussion

The present study reported higher number of unnatural deaths from rural area (93.88%) and Hindu religion (95.92%) which has concurrence with the observation made by Kumar A et.al who found in their study conducted at Varanasi involving children below 19 years of age that 88.37% were rural inhabitants and 89.83% belonged to Hindu religions. However, they reported male predominance (56.55%) in contrast to the female (55.19%) of the present study.[16]

Kanchan T et.al reported in their study conducted at Manipal that Road traffic injuries were responsible for maximum mortalities (38.4%), followed by those because of burns (24.9%) and poisoning (15.9%). Males comprised 59.6% of cases. Male-to-female ratio was 1.5:1. Males predominantly died of traffic injuries (45.2%), whereas females as a result of burns (37.4%).[17] The present study reported predominant female death (55.1%) with M: F=1:1.23. Both male & female predominantly (59.1% & 29.63%) died of accidents which included RTA, snake bite, drowning etc. and 18.52% female death was due to burns. However, the study of Kanchan T et.al involved children and adolescents.

A study conducted by Gonnade U et.al at Maharashtra reported that around 73 percent of burns cases were female. Out of the 88.75 percent married victims three fourth (75%) were females.[18] The present study showed that 100% burns victims were female and half of them were married.

In this study most of the cases took place in the rural area which might be due to multiple causes like high probability of snake bite, lightning due to thunder fall, drowning, death caused by easy accessibility of pesticides at household level etc. As per Ghatak S, the most suicidal deaths took place in rural areas because of the higher availability of pesticides combined with poorer access to emergency medical care in such areas. Indians prefer to consume pesticides for killing themselves instead of taking an overdose of sleeping pills. Therefore, the fatality rates may be higher in India as compared to the western countries. Nearly, 49 percent suicide deaths in men and 44 per cent suicide deaths in women aged 15 years and above occurred due to poisoning, mostly from consuming pesticides.[19]

In accordance to the study carried out by Kitulwatte I D et.al at a teaching hospital in Sri Lanka the present study also revealed that the suicidal death was more common in higher age group.[20]

Meel B L carried out a study between 1996 and 2004 at Umtata General Hospital (UGH) reviewing medico-legal autopsies of subjects aged 18 years or below and reported that trauma accounted for 70.9% deaths and 29.1% deaths were due to other causes such as hanging, burns, lightning stroke, drowning, gas suffocation, falls from a height and poisoning. Motor vehicle accidents and homicides accounted for 45.6% and 54.4% deaths. Hanging, 81 (19.2%), drowning, 166 (39.4%), lightning strike, 38 (9%), burns, 51 (12.1%), gas suffocation, 24 (5.7%), poisoning, 33 (8.4%) and falls from a height 28 (6.7%) were non-traumatic deaths.[21] Contrary to that the present study reported only 3.06% homicidal death. But 19.39% death due to hanging/throttling/strangulation,10.2% out of burns etc. were found to be in concurrence, however, death from poisoning (21.43%) was definitely higher in this study.

Majority (47.62%) of the accidents took place in Rainy season which might be due to higher incidence of snake bite (10 out of 12 cases), lightning (5 cases), drowning (3 out of 6 cases) etc. Fifty percent of drowning also happened in Rainy season might be as a result of accidental drowning in fully filled up ponds, canals etc. which are usually used by the people of rural area for various purposes like bathing, cleaning and fishing etc.. Around 43 percent poisoning found to happen in Autumn and might partly be due to easy accessibility of pesticide at household level during this period because of its increase use for spraying on the growing 'Aaman' paddy plants in the study area. Kumar A et.al observed in their study that Summer seasons (38.99%) contributed most of the unnatural deaths in contrast to the rainy season as reported by this study.[16]

Limitation of the study: Sample size was small consisting of only one year's unnatural deaths. Analysis involving data for few more years e.g. five years could help between groups comparison more effective by meeting the requirement of adequate sample size of different subgroups and also could reflect the changing pattern over time i.e. trend. Patients' information was limited and the study would have been better if other data regarding deceased's education, occupation, socio-economic status, addiction, chronic morbid etc. were available. Being a hospital based study without any denominator cause specific population rates, ratio couldn't be calculated for extrapolation and effective utilisation in policy making for any particular population/ community.

V. Conclusion

Forty five percent of unnatural deaths was contributed by suicide. Fifty percent of the total deceased were victims of such causes of unnatural death which led to very rapid fatal outcome not allowing any scope of arranging any sort of resuscitation measures. It is needless to say that for this group of cause of death prevention is the best measure. Multipronged concerted efforts should be taken to develop congenial environment for successful fostering of responsible groups to monitor, evaluate and mentor adolescents. During any behaviour change they, specially the parents can help adolescents by providing love, affection, care and concern, and hold their hands for leading a successful life in stressful period, without the journey unreached letting the dreams unfulfilled,the goals unachieved. Parents, teachers, career guides, seniors, office masters, physicians etc. are the stakeholders and increasing awareness and behaviour change communication (BCC) of them regarding the problems and needs of adolescence may be the starting block. Measures like strict enforcement of traffic rules, certifying system by Panchayat Raj Institution (PRI) for purchasing of pesticide can also yield palpable outcome. The cause of death was found to vary across gender and sex- specific programmes and interventions need to be developed to avert further increase in mortality with special emphasis in rural settings. Innovation for better treatment modality for burns and mild to moderate degree of poisoning may bring better hope in future. A community based study would help more in this regards.

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