Original Article

Indian Journal of Forensic Medicine and Pathology
Volume 10 Number 3, July - September 2017
DOI: http://dx.doi.org/10.21088/ijfmp.0974.3383.10317.7

Study of Frequency of System Involvement and Survival Period in Sudden Natural Non-Traumatic Deaths

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Abstract

Background: Many cases of sudden natural non-traumatic deaths (SNND) occur in individuals without known medical diseases. Many systems, more commonly cardiovascular and respiratory, are known to be involved in such deaths. This prospective autopsy based study was decided to determine the frequency of system involvement & survival period in sudden natural non-traumatic deaths. *Material and Methods:* During the study period from 1st October 2010 to 31st August 2012 total 1711 consecutive medico-legal autopsies were performed by the Department of Forensic Medicine and Toxicology, S.V.N. Government Medical College, Yavatmal, of which 125 (7.3%) cases were turned out to be of SNND, which were studied to determine the frequency of system involvement & survival period. *Results:* Maximum i.e. 41 (32.8%) cases were related to cardiovascular system causes followed by 32 (25.6%) to respiratory system causes. 17 (13.6%) cases related to central nervous system causes, 20 (16%) were related to gastrointestinal system causes, 05 (04%) due to genitourinary system causes and 10 (08%) were of miscellaneous causes. Out of cardiovascular causes, coronary artery disease contributed for 80.4% of cases. Out of total 125 cases, 71 (56.8%) cases survived less than 6 hours, 22 (17.6%) survived between 06 to 12 hours, 23 (18.4%) survived between 12 to 18 hours and 09 (7.2%) survived between 18 to 24 hours. It is pertinent to note that the primary system involved has had direct correlation with survival period. Out of cardiovascular cases, 37 (90.2%) survived less than 6:00 hours and 17 (41.5%) survived less than 1:00 hour. The system wise difference in period of survival was found to be statistically significant in hours (χ^2= 46.91, p= 0.00003801). Average survival period for SNND cases was 06:56±0.26 hours and lowest i.e. 02:37±0.14 hours for deaths due to cardiovascular causes. *Conclusion:* Cardiovascular system pathologies remain the leading cause of sudden natural non-traumatic deaths with lowest survival period in this study. The people should undergo regular medical check-ups for early detection and proper management of cardiovascular diseases. Importance of survival period is for the assessment of suddenness of death, vulnerability of system and for future planning and providing of transport facilities and emergency medical service depots to cope with immediate events prior to death.

Keywords: Sudden Natural Non-Traumatic; Deaths; Autopsy; System Involvement; Survival Period.

Introduction

The World Health Organization (WHO) defines the sudden death as a death, which occurs within 24 hours from the onset of terminal illness [1].

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Received on 25.07.2017, **Accepted on** 04.08.2017

Natural deaths are those which occur entirely due to natural diseases without any trauma, poisoning or accidental or suicidal or homicidal in origin. An apparently healthy individual of any age dies suddenly and unexpectedly without any pre-indication or in case of natural death under suspicious state; a suspicion of foul play may arise. These cases may also be subjected to medico-legal autopsy [2].

Sudden natural deaths undoubtedly constitute a significant portion of deaths which undergo autopsy for investigation of death. Therefore, prospective autopsy based study was decided to determine the frequency of system involvement & survival period in sudden natural non-traumatic deaths (SNND).

Material and Methods

During the study period from 1st October 2010 to 31st August 2012 total 1711 consecutive medico-legal autopsies were performed by the Department of Forensic Medicine and Toxicology, S.V.N. Government Medical College, Yavatmal, of which 125(7.3%) cases were turned out to be of SNND, which were studied to determine the frequency of system involvement & survival period.

Results

Out of total 125 cases of SNND, maximum i.e. 41 (32.8%) cases were related to cardiovascular system causes followed by 32(25.6%) to respiratory system causes. 17(13.6%) cases related to central nervous system causes, 20(16%) were related to gastrointestinal system causes, 05(04%) due to genitourinary system causes and 10(08%) were of miscellaneous causes. Out of cardiovascular causes, coronary artery disease contributed for 80.4% of cases (Table 1).

It was observed that, 71(56.8%) cases survived less than 6 hours, 22(17.6%) survived between 06 to 12 hours, 23(18.4%) survived between 12 to 18 hours and 09(7.2%) survived between 18 to 24 hours. It is pertinent to note that the primary system involved has had direct correlation with survival period. Out of cardiovascular cases, 37(90.2%) survived less than 6:00 hours and 17(41.5%) survived less than 1:00 hour. Cardiovascular system involvement was observed to be associated with minimum survival period (Table 2).

The system wise difference in period of survival was found to be statistically significant in hours (χ^2= 46.91, p= 0.00003801).

Survival period means duration between onset of terminal symptom and death. It was observed that, average survival period for sudden natural non-traumatic death causes was 06:56±0.26 hours, 02:37±0.14 hours for cardiovascular, 07:59±0.27 hours for respiratory, 06:40±0.18 hours for central nervous, 11:03±0.31 hours for gastrointestinal, 09:06±0.23 hours for genitourinary and 12:19±0.26 hours for miscellaneous causes (Table 3).

Table 1: Systems involved in SNND cases (n=125)

System	No. of Cases (%)
Cardiovascular System	41 (32.8%)
Respiratory System	32 (25.6%)
Central nervous system	17(13.6%)
Gastrointestinal system	20 (16%)
Genitourinary system	05 (4%)
Miscellaneous	10 (8%)

Table 2: Distribution of SNND cases as per survival period (n=125)

Primary system involved	Survival Period (In Hours) Number of cases (percentage)				Total (%)
	00 to 06	06 to 12	12 to 18	18 to 24	
CVS	37 (90.2%)	02 (4.9%)	02 (4.9%)	00 (00%)	41 (100%)
RS	15 (46.9%)	08 (25%)	06 (18.8%)	03 (9.3%)	32 (100%)
CNS	08 (47%)	07 (41.2%)	02 (11.8%)	00 (00%)	17 (100%)
GIT	07 (35%)	02 (10%)	07 (35%)	04 (20%)	20 (100%)
GUT	02 (40%)	01 (20%)	02 (40%)	00 (00%)	05 (100%)
MISC	02 (20%)	02 (20%)	04 (40%)	02 (20%)	10 (100%)
Cases (%)	71(56.8%)	22(17.6%)	23(18.4%)	09(7.2%)	125(100%)

(χ^2= 46.91, Degree of Freedom 15, p= 0.00003801).

Table 3: System wise survival period of SNND cases (n=125)

Cause / No. of cases	Survival period (Hours : Minutes)		
	Minimum	Maximum	Average ± SD*
Cardiovascular / 41	00:15	17:25	02:37 ± 0.14
Respiratory / 32	00:20	23:15	07:59 ± 0.27
Central nervous / 17	00:30	14:30	06:40 ± 0.18
Gastro intestinal / 20	00:40	22:00	11:03 ± 0.31
Genitourinary / 5	02:15	16:00	09:06 ± 0.23
Miscellaneous / 10	02:55	21:00	12:19 ± 0.26

*SD = Standard deviation

Discussion

System Wise Distribution

It is very important to know the vulnerability of system in cases of SNND in planning for speciality care services in rural set ups to prevent SNND. In present study (Table 1), Maximum i.e. 41(32.8%) cases were related to cardiovascular system causes followed by 32(25.6%) to respiratory system causes. 17(13.6%) cases related to central nervous system causes, 20(16%) were related to gastrointestinal system causes, 05(04%) due to genitourinary system causes and 10(08%) were of miscellaneous causes. This observation is consistent with matter quoted by Nandy [3], Reddy [1], Dikshit [4] and Udnoon et al [5].

Most vulnerability of the cardiovascular system for SNND is attributed due to the risk factors, emotions, dietary habits, sedentary life style, addictions, physical and mental stress effect individually or collectively.

Survival Period

Survival period means duration between onset of terminal symptom and death. The definition as to what constitute sudden death is variable. Depending on one's definition, the maximum time interval varies anywhere from 1 to 24 hours. So sudden death may be 1) Instantaneous death – Literally, the individual falls down dead. 2) Death within one hour of onset of symptoms. 3) Death within 1-24 hours of onset of symptoms [6]. Spain et al [7] divided cases into three groups i.e. 1) less than one hour 2) between one and three hour and 3) undetermined (un witnessed). Kuller et al [8] distributed cases in two groups i.e. less than 12 hours and 12-24 hours. Topaz and Edwards [9] used the definition of sudden death as, an unexpected natural phenomenon in which loss of all vital functions occurs instantaneously or within 6 hours of the onset of symptoms of collapse.

In the present study (Table 2), it was observed that, maximum 71 (56.8%) cases survived less than 6 hrs, 22 (17.6%) survived between 06 to 12 hrs, 23 (18.4%) survived between 12 to 18 hrs and 09 (7.2%) survived between 18 to 24 hrs.

In the present study (Table 3), it was observed that, average survival period for SNND cases was 06:56±0.26 hours and lowest i.e. 02:37± 0.14 hours for deaths due to cardiovascular causes.

Out of cardiovascular cases (Table 2), 37(90.2%) survived less than 6:00 hours and 17(41.5%) survived less than 1:00 hour. This is consistent with the matter quoted by Park [10], studies of Scott et al [11] and Topaz and Edwards [9]. It is very important to assess the survival period in case of SNND to know the rapidity of deaths, vulnerability of system and for future planning and providing of transport facilities and emergency medical service depots to cope with immediate events prior to death.

Conclusion

To conclude, cardiovascular system pathologies remain the leading cause of sudden natural non-traumatic deaths with lowest survival period in this study. Although the study was conducted in rural district set up the people should be more conscious of their health and undergo regular medical check-ups for early detection and proper management of cardiovascular diseases. Importance of survival period is for the assessment of suddenness of death, vulnerability of system and for future planning and providing of transport facilities and emergency medical service depots to cope with immediate events prior to death.

Conflict of Interest: None to declare

Source of Funding: Nil

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