

# A prospective autopsy based study of sudden natural non-traumatic deaths in a rural district

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## Abstract

**Introduction:** Sudden natural death, especially when it occurs in an apparently healthy person, can have a great impact on society. Sudden natural deaths undoubtedly constitute a significant portion of deaths which undergo autopsy for investigation of death. Therefore, a prospective autopsy based study of sudden natural non-traumatic deaths (SNND) was decided to determine age, sex and system wise involvement. **Aims and Objectives:** The study was aimed to find out the burden (percentage) of sudden natural non-traumatic deaths and also to determine age, sex and body system wise involvement. **Material and Methods:** This prospective autopsy based study was conducted in the Department of Forensic Medicine and Toxicology, Shri V. N. Government Medical College, Yavatmal, Maharashtra, India. During study period from 1<sup>st</sup> October, 2010 to 31<sup>st</sup> August, 2012, total 1711 medico-legal autopsies were conducted in the department, of which those cases which were turned out to be sudden natural non-traumatic deaths (SNND) were studied. **Observations and Results:** The burden (percentage) of SNND cases was 7.3% (125/1711). Total SNND cases were 125, out of which maximum number of cases i.e. 72 (57.6%) were seen in the age group of 21 to 50 years. The average age of SNND was 37.5 ± 18.5 years for both sexes. Amongst 125 cases, maximum i.e. 92 (73.6%) were males and 33 (26.4%) were females. The male to female ratio was 2.8:1. Out of total 125 cases of SNND, maximum i.e. 41 (32.8%) cases were of cardiovascular causes followed by 32 (25.6%) due to respiratory causes. 17 (13.6%) cases were of central nervous causes, 20 (16%) were of gastrointestinal causes, 05 (04%) due to genitourinary causes and 10 (08%) were of miscellaneous causes. System wise differences in male and female cases was found to be statistically significant ( $\chi^2=17.22$ ,  $p=0.004105$ ). An age group wise difference in male and female cases was found to be statistically significant ( $\chi^2=21.38$ ,  $p=0.003246$ ). **Conclusion:** Sudden death was the most common indication in natural deaths for medico-legal autopsy. Burden of sudden natural non-traumatic death (SNND) cases was 7.3%. So, it is the need of time to implement necessary steps to reduce this burden. SNND cases had male preponderance and target age group for maximum SNND cases was 21 to 50 years. Cardiovascular system was most vulnerable. Survival period, rapidity of death and their frequent occurrence must be considered in planning emergency referral, transport and emergency and super speciality medical services to cope with immediate events prior to death.

**Key Words:** Autopsy, Sudden, Natural, Non-traumatic, Deaths

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## INTRODUCTION

Virtually all Forensic Experts deal not only with suspicious, accidental and suicidal deaths, but with a wide

range of deaths from natural causes. Many of these are sudden, unexpected, clinically unexplained, or otherwise obscure, even though there need be no unnatural element in their causation<sup>1</sup>. The World Health Organization (WHO) defines the sudden death as a death, which occurs within 24 hours from the onset of terminal illness<sup>2</sup>. The most widely accepted definition of sudden death is a death which is not known to have been caused by any trauma, poisoning or violent asphyxia, and where death occurs all on a sudden or within 24 hours of the onset of terminal symptoms<sup>3</sup>. Natural death means death occurring due to natural diseased or pathological condition, old age, debility or devitalisation, in which death is not intended or attempted and also not occur accidentally<sup>3</sup>. Sudden natural death, especially when it

occurs in an apparently healthy person, can have a great impact on society<sup>4</sup>. Sudden natural deaths undoubtedly constitute a significant portion of deaths which undergo autopsy for investigation of death. Therefore, prospective autopsy based study of sudden natural non-traumatic deaths was decided to determine age, sex and system wise involvement.

### AIMS AND OBJECTIVES

1. To find out the burden (percentage) of sudden natural non-traumatic deaths.
2. To determine age, sex and system wise involvement of sudden natural non-traumatic deaths.

### MATERIAL AND METHODS

This prospective autopsy based study was conducted in the Department of Forensic Medicine and Toxicology, Shri V. N. Government Medical College, Yavatmal, Maharashtra, India. During study period from 1<sup>st</sup> October, 2010 to 31<sup>st</sup> August, 2012, total 1711 medico-legal autopsies were conducted in the department, of which those cases which were turned out to be sudden natural non-traumatic deaths (SNND) were studied.

### OBSERVATIONS AND RESULTS

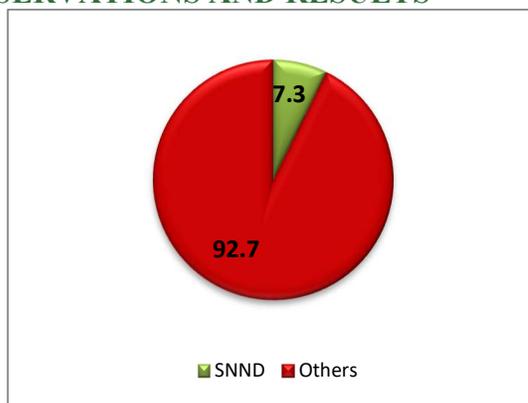


Figure 1: Burden (percentage) of Sudden Natural Non-traumatic Death (SNND) cases (n=125)

During study period, total 1711 medico-legal autopsies were performed by the department; of which 125 (7.3%) cases were of SNND. So, the burden (percentage) of SNND out of total medico-legal autopsy cases was 7.3% (125/1711).

Table 1: Age, Sex and System wise distribution of SNND cases (n=125)

Age group (In Years)	System (Cases)	Cardio-vascular T(M:F)*	Respiratory T(M:F)	Central Nervous T(M:F)	Gastro-Intestinal T(M:F)	Genito-Urinary T(M:F)	Miscellaneous T(M:F)	Total T(M:F)
0 – 10		0(0:0)	5(3:2)	1(0:1)	1(0:1)	0(0:0)	5(1:4)	12(4:8)
11 – 20		1(0:1)	5(2:3)	0(0:0)	3(2:1)	1(1:0)	3(2:1)	13(7:6)
21 – 30		4(3:1)	7(3:4)	2(2:0)	4(4:0)	3(0:3)	1(1:0)	21(13:8)
31 – 40		9(8:1)	4(3:1)	6(6:0)	4(3:1)	1(0:1)	1(1:0)	25(21:4)
41 – 50		17(16:1)	4(4:0)	3(2:1)	2(2:0)	0(0:0)	0(0:0)	26(24:2)
51 – 60		7(5:2)	2(2:0)	3(2:1)	5(5:0)	0(0:0)	0(0:0)	17(14:3)
61 – 70		1(1:0)	3(2:1)	2(2:0)	1(1:0)	0(0:0)	0(0:0)	07(6:1)
71 – 80		2(2:0)	2(1:1)	0(0:0)	0(0:0)	0(0:0)	0(0:0)	04(3:1)
<b>Total</b>		<b>41(35:6)</b>	<b>32(20:12)</b>	<b>17(14:3)</b>	<b>20(17:3)</b>	<b>5(1:4)</b>	<b>10(5:5)</b>	<b>125(92:33)</b>

\*T(M: F) = Total (Male: Female), \*\* ( $\chi^2=17.22, p= 0.004105$ ), \*\*\* ( $\chi^2= 21.38, p= 0.003246$ )

Total SNND cases were 125, out of which maximum number of cases i.e. 72 (57.6%) were seen in the age group of 21 to 50 years with peak incidence i.e. 26 (20.8%) in the age group 41 to 50. The least affected age group was 71-80 years with 4 (3.2%) deaths. The average age of SNND was  $37.5 \pm 18.5$  years for both sexes. The average age of SNND for male was  $41.3 \pm 16.4$  years and for female  $26.8 \pm 20$  years. Amongst 125 cases, maximum i.e. 92 (73.6%) were males and 33 (26.4%) were females. The male to female ratio was 2.8:1. Out of total 125 cases of SNND, maximum i.e. 41 (32.8%) cases were of cardiovascular causes followed by 32 (25.6%) due to respiratory causes. 17 (13.6%) cases were of central nervous causes, 20 (16%) were of

gastrointestinal causes, 05 (04%) due to genitourinary causes and 10 (08%) were of miscellaneous causes.

\*\*System wise differences in male and female cases was found to be statistically significant ( $\chi^2=17.22, p=0.004105$ ).

\*\*\*Age group wise differences in male and female cases was found to be statistically significant ( $\chi^2= 21.38, p=0.003246$ )

### DISCUSSION

“While there are many diseases, there is, in a sense, only one health.”<sup>5</sup> The aim of this study was to ascertain various aspects of sudden natural deaths in the community. It is mandatory to have a clear picture of the amount of disease (“disease load”) in the population.

Measurement of mortality is straightforward. Morbidity has two aspects- incidence and prevalence. Traditionally and universally, most epidemiological studies begin with mortality data. Many countries have routine systems for collecting mortality data. Mortality data provides the starting point for many epidemiological studies. In fact, they are the major resource for the epidemiologist<sup>5</sup>.

### Burden (Percentage) of SNND

“Percentage is an indicator of burden of SNND in the community.” It is also an indicator which is useful for taking action to control deaths, for research into aetiology and pathogenesis, distribution of cases, and efficacy of preventive and therapeutic measures. During the study period (Fig No.1), a total 1711 medico-legal autopsies were performed by the department, of which 125 (7.3%) cases were of sudden natural non-traumatic deaths (SNND). In the present study, Percentage of SNND coincides with the studies of Sarkioja *et al*<sup>6</sup> (5%), Siboni *et al*<sup>7</sup> (4.1%), Zanjad *et al*<sup>8</sup> (8.9%), Rao *et al*<sup>9</sup> (8.67%) and matter quoted in Nandy<sup>3</sup> (10%) and Reddy<sup>2</sup> (10%). It does not coincide with studies of Chaturvedi *et al*<sup>10</sup> (0.99%), Kuller *et al*<sup>11</sup> (31.4%), Escoffery *et al*<sup>12</sup> (51.3%), Meina singh *et al*<sup>13</sup> (2.66%) and Azmak AD<sup>14</sup> (28.99%). This may be possibly due to different geographical areas and different constitution and life styles of people, differences in selection of cases and demographic variation.

### Age

Age is strongly related to disease than any other single host factor. Certain diseases are more frequent in certain age groups than in others. Many chronic and degenerative diseases show a progressive increase in prevalence with advancing age. This may reflect a persistent and cumulative exposure to a causal agent or risk factor<sup>5</sup>. In present study, the average age for SNND was  $37.5 \pm 18.5$  years for both sexes. The average age of SNND for male was  $41.3 \pm 16.4$  years and for female  $26.8 \pm 20$  years. It was observed that (Table No.1), maximum number of SNND cases i.e. 72 (57.6%) were seen in the age group of 21 to 50 years with peak incidence i.e. 26 (20.8%) in the age group 41 to 50. The least affected age group was 71-80 years with 4 (3.2%) deaths. This finding is consistent with studies of Kumar *et al*<sup>15</sup> (41-50 years), Rao *et al*<sup>9</sup> (45-65 years), Sarkioja *et al*<sup>6</sup> (40-49 years), Udnoon *et al*<sup>4</sup> (46-60 years), Chaturvedi *et al*<sup>10</sup> (30-35 years), Kagne *et al*<sup>16</sup> (31-40 years), Meina singh *et al*<sup>13</sup> (31-40 years), Zanjad *et al*<sup>8</sup> (31-40 years), and not consistent with studies of Azmak AD<sup>14</sup> (50-59 years) and Escoffery *et al*<sup>12</sup> (61-70 years). This may be due to more and more recent westernisation of Indian society, sedentary life style, physical and mental stress,

lower socio-economic status, geographic and demographic variations, addictions and infections.

### Sex

Sex is another host characteristic which is often correlated and studied in relation to diseases. Variations in disease frequency between sexes have been ascribed to a) basic biological differences between the sexes, including sex-linked genetic inheritance, and b) hormonal, cultural and behavioural differences between the sexes (e.g., smoking, alcoholism) due to different roles in social setting<sup>5</sup>. In present study (Table No.1), maximum i.e. 92 (73.6%) were males and 33 (26.4%) were females. The male to female ratio was 2.8:1.

Sex wise distribution of SNND cases in similar studies is summarized as follows:

Study	Male (%)	Female (%)
Sarkioja <i>et al</i> <sup>6</sup> (1984)	82	18
Thomas <i>et al</i> <sup>17</sup> (1988)	73.9	26
Anderson <i>et al</i> <sup>18</sup> (1994)	Males > females	
Kagne <i>et al</i> <sup>16</sup> (1999)	Male to Female Ratio- 2.04:1	
Meina singh <i>et al</i> <sup>13</sup> (2002)	94.5	5.5
Puranik <i>et al</i> <sup>19</sup> (2005)	70.7	29.3
Zanjad <i>et al</i> <sup>8</sup> (2006)	84.8	15.1
Azmak AD <sup>14</sup> (2007)	83.4	16.6
Kumar <i>et al</i> <sup>15</sup> (2007)	87.16	12.84
Rao <i>et al</i> <sup>9</sup> (2008)	Male to female Ratio- 5.8:1	
Udnoon <i>et al</i> <sup>4</sup> (2009)	Male to female Ratio- 2.2 :1	
Chaturvedi <i>et al</i> <sup>10</sup> (2011)	76.6	23.4
<b>Present study</b>	<b>73.6</b>	<b>26.4</b>

In present study as well as in most of the other studies, males were greatly outnumbered the females.

### 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 No.1), highest i.e. 41 (32.8%) cases died due to cardiovascular causes followed by 32 (25.6%) due to respiratory causes, 20 (16%) due to gastrointestinal causes, 17 (13.6%) due to central nervous causes, 10 (08%) due to miscellaneous causes and lowest i.e. 05 (04%) due to genitourinary causes. This observation is consistent with matter quoted by Nandy<sup>3</sup>, Reddy<sup>2</sup>, Dikshit<sup>20</sup> and Udnoon *et al*<sup>4</sup>. Out of SNND causes, cardiovascular causes were highest i.e. 41(32.8%) This observation is consistent with the matter quoted by Nandy<sup>3</sup> (45%), Reddy<sup>2</sup> (45-50%), Dikshit<sup>20</sup> (45-50%), Pillay<sup>21</sup> (45%) and majority of studies i.e. Kuller *et al*<sup>11</sup> (40.5%), Luke *et al*<sup>22</sup> (38%), Wentworth *et al*<sup>23</sup>, Penttila Anti<sup>24</sup>, Sarkioja *et al*<sup>6</sup> (83%), Siboni *et al*<sup>7</sup> (46.2%), Thomas *et al*<sup>17</sup> (69.5%), Fornes *et al*<sup>25</sup>, Anderson *et al*<sup>18</sup> (53.4%), Meina singh *et al*<sup>13</sup> (32.7%), De la Grandmaison and Durigon<sup>26</sup> (72.7%), Puranik *et al*<sup>19</sup> (56.4%), Zanjad *et al*<sup>8</sup> (49.5%), Azmak AD<sup>14</sup> (55%), Kumar *et al*<sup>15</sup> (64.9%),

Udnoon *et al*<sup>4</sup> (44.7%) and not consistent with the studies i.e. Kagne *et al*<sup>18</sup> (23.2%), Escoffery *et al*<sup>12</sup> (7%) and Chaturvedi *et al*<sup>10</sup> (6.25%) because other system causes were highest in their study. Most vulnerability of the cardiovascular system for SNND are attributed due to the risk factors, emotions, dietary habits, sedentary life style, addictions, physical and mental stress or simply “**Hurry Worry and Curry**” effect individually or collectively. Lowest i.e. 05 (4%) cases were due to genitourinary causes. This observation is consistent with the matter quoted by Nandy<sup>3</sup> (4%), Reddy<sup>2</sup> (3-5%), Dikshit<sup>20</sup> (3-5%) and study of Udnoon *et al*<sup>4</sup> (3.5%).

## CONCLUSION

Sudden death was the most common indication in natural deaths for medico-legal autopsy. Burden of sudden natural non-traumatic death (SNND) cases was 7.3%. So, it is the need of time to implement necessary steps to reduce this burden. SNND cases had male preponderance and target age group for maximum SNND cases was 21 to 50 years. Cardiovascular system was most vulnerable. Amongst those who died of cardiovascular causes 85.3% were males and out of genitourinary causes 80% were females. Survival period, rapidity of death and their frequent occurrence must be considered in planning emergency referral, transport and emergency and super speciality medical services to cope with immediate events prior to death.

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