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Original Research Article

Correlation between suicide and organ weight

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ABSTRACT

Background: Human organ weights play a significant role in clinical and forensic settings, as cause of death in suicidal cases may affect organ weight and may be used in the detection of anatomical and pathological abnormalities.
Aims: Our study's aim is to find out a correlation between organ weights and suicide and any variations in organ weight if different method of suicide is used.
Materials and Methods: Present study was conducted in the department of Forensic Medicine and Toxicology, Lady Hardinge Medical College on a total of 50 cases of suicide brought to the mortuary for post-mortem examination. The socio-demographic profile of victims of suicide was analyzed after obtaining the relevant data from the relatives and the accompanying investigating officer. Weights of various internal organs of the body were also measured and any changes in the weight recorded. All the internal organs were weighed using organ weight measuring machine and noted for any change in the weight.
Results: Hanging was the most common method (62%), followed by poisoning (24%) and self immolation (10%). The weights of internal organs were increased in majority of cases of suicides.
Conclusion: There was a positive correlation between weight of internal organs and cause of death mainly in hanging, poisoning and burns suicidal cases.

1. Introduction

Suicide is a world-wide public health problem and a leading cause of death and second commonest manner of unnatural death flanked by accident and homicide.[1] About 800000 people commit suicide worldwide every year.[2] Of these 135,000 (17%) are residents of India,[3] a nation with 17.5% of world population. Suicide is a leading cause of death claiming approximately 30,000 lives in the United States each year (NCIPC, 2000) and almost one million annually world-wide.[4]

During autopsy, organ weight measurements are helpful for forensic pathologists in the detection of gross anatomical abnormalities and pathology.[5] In addition, deviations from "normal" range of organ weights may aid the pathologist in interpretation of cause of death.[6–8] Organ weights also play crucial role during cardiothoracic and abdominal organ transplantation surgeries.[9,10] However a number of parameters influence organ weight. Demographic parameters such as the age, sex, population grouping and the body length of an individual; as well as environmental conditions have an influence on organ weights.[7,11,12]

Range of suicidal behaviour can be from thoughts about committing suicide, a plan made for committing suicide and attempt[13] to death. Addictive and mental disorders are major risk factors for suicide in all age groups. Other risk factors are male gender, prior suicide attempt, disrupted marital status, reduced brain stem serotonergic activity, family history of psychiatric disorders and a recent severely stressful life event.[14]

Various studies indicate a possible correlation between organ weights and Suicide. Brain weight of victims of suicide was found significantly higher than of those who

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died of natural causes.[15] Our study's aims is to find out whether there is positive correlation between organ weights and suicide and whether there are any variations in organ weight if different method of suicide is used.

2. Materials and Methods

The present study was conducted in the department of Forensic Medicine and Toxicology, Lady Hardinge Medical College on a total of 50 cases of suicide brought to the mortuary for post-mortem examination. The socio-demographic profile of victims of suicide was analyzed after obtaining the relevant data from the relatives and the accompanying investigating officer. Weights of various internal organs of the body were also measured and any changes in the weight recorded. All the internal organs were weighed using organ weight measuring machine and noted for any change in the weight.

Case history was recorded on a Performa as described in the protocol after obtaining a formal consent from relatives in writing to provide the required information for the above mentioned study. The Performa also included the details regarding a brief history of the incidence, personal history, any precipitating factor, and family history. The details and photographs of the scene of crime were taken from the Investigating Officer and psychological autopsy was done in each case in an attempt to assess the mental state of the victim just before the act.

3. Results and Observations

In the present study all the internal organs were weighed using organ weight measuring machine and noted for any increase in the weight.

Table 1 Shows that the weight of the brain varied in males from maximum 1900gms to minimum 900gms and in females from maximum 1850gms to minimum 1150gms and weight of the brain was more than 1500gms in 15 cases ((30%) in males and 4 cases (8%) in females.

The weight of right lung varied from maximum 770gms to minimum 420gms in males and maximum 750gms to minimum 410gms in females. The weight of left lung varied from maximum 710gms to minimum 400gms in males and maximum 700gms to minimum 380gms in females. The weight of right lung was more than 550gms in 9 cases (18 %) of males and 6 (12%) of females whereas weight of left lung was more than 550gms in 3 cases in (6%) males and 2 (4%) in females. The weight of right kidney varied from maximum 180gms to minimum 80gms in males and maximum 175gms to minimum 85gms in female. The weight of left kidney varied from maximum 190gms to minimum 85gms in males and maximum 180gms to minimum 80gms in female. The weight of right kidney was more than 125gms in 4 cases in (8 %) males and 1 case (2%) in females whereas the weight of left kidney was more than 125gms in 17 cases (34 %) in males and 3(6%) in females. It was noted that the weight of the spleen varied in males from maximum 200gms to minimum 80gms and in females from maximum 240gms to minimum 130gms and weight of the spleen was more than 125gms in 29 (58 %) males and 10 (20%) females. Liver was more than 1550gms in 24 (48 %) males and 5 (10%) females (Table 1). Mean was obtained in relation to organ weights and application of Chi-square test and student t-test was not found appropriate.

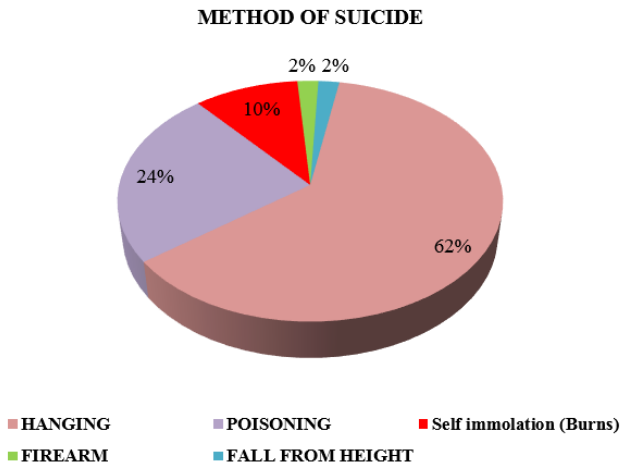

Fig. 1: Methods of Suicide

Figure 1 shows that hanging was the most common method (62%), followed by poisoning (24%) and self immolation (10%). Table 2 shows relationship between weights of internal organ with cause of death and there was a positive correlation between weight of organs and cause of death mainly hanging, poisoning and burns.

In cases where cause of death was hanging, weight of liver was increased in 14 cases (28%), increase in brain weight in 8 cases (16%). Weight of lung was increased in 14 cases (28%) of hanging and kidneys in 12 cases (24%) of cases whereas spleen weight was increased in 25 cases (50%) of hanging.

In cases where cause of death was poisoning, weight of liver was increased in 7 cases (14%), increase in brain weight in 6 cases (12%). Weight of lung was increased in 7 cases (14%) of poisoning and kidneys in 6 cases (12%) whereas spleen weight was increased in 9 cases (18%) of poisoning.

In burn cases, weight of liver was increased in 3 cases (6%), brain weight in 3 cases (6%), and lung weight in 3 cases (6%). Weight of kidneys was increased in 4 cases (8%) of burns whereas spleen weight was increased in 5 cases (1%) of burns. In none of the cases of fall from height, shooting (Firearm) organ weight was increased.

Table 1: Weight ofinternal organs

Internal organs	Weight (In (Gms)					
	Males			Females		
	Maximum	Minimum	Mean	Maximum	Minimum	Mean
Brain	1900	900	1479.38	1850	1150	1477.99
Liver	2000	1080	1569.8	2500	1200	1568.96
Lungs (right)	770	420	538.16	750	410	537.5
Lungs (left)	710	400	505.102	710	380	505.2
Spleen	200	80	154.69	240	130	154.54
Kidneys (right)	180	80	122.24	175	85	122.08
Kidneys (left)	190	85	134.28	180	80	133.95

Table 2: Relationship of weight of internal organs with cause of death

Cause of death	Increase in weights of internal organs (Percentage of cases)				
	Brain	Liver	Lungs	Kidneys	Spleen
Hanging	16	28	28	24	50
Poisoning	12	14	14	12	18
Burns (Self-immolation)	6	6	6	8	10
Fall from height	0	0	0	0	0
Shooting (Firearm)	0	0	0	0	0

4. Discussion

Suicide is a world-wide public health problem and a leading cause of death and second commonest manner of unnatural death flanked by accident and homicide.[1] In the present study the internal organs were weighed using organ weight measuring machine and noted for any changes in the weight. It was noted that there was an increase in weights of all the organs.

Study done by Salib E and Tadros G[15] explored variations in post-mortem brain weight in different methods of fatal self-harm (FSH) and in deaths from natural causes. Post-mortem brain weight for 142 FSH victims and 150 victims of unexpected, sudden or unexplained death due to natural causes, and from various methods of FSH, were compared. Brain weight of victims of FSH was significantly higher than of those who died of natural causes; brain weights in both groups were within the normal range. There was no significant difference in brain weight between different methods of FSH ($P > 0.05$). The study concluded that the findings require critical examination and further research by include data from younger age groups. There is a need for regional or national suicide neuro-pathological database.[15]

A study was conducted by Hamilton SJ and McMahon RF[16] to ascertain whether brain weight is different in people of a younger age who commit suicide than in those who die accidentally, a retrospective review of post-mortem reports collecting height, weight and brain weight in 100 suicide victims (87 males, mean age 38.5 years) and 100 age/gender-matched controls who died accidentally or of natural causes (87 males, mean age 38.7 years). Comparison by t-test was made of brain weight in isolation as well as brain weight corrected for height, weight and body mass index. It was revealed that no significant difference in brain weight in suicide cases compared to the general population ($P > 0.05$). The brain weight of those who died by hanging was significantly higher than of those who died by overdose. Thus, it was concluded that that whatever the significant neuropsychiatric elements are that influence suicidal behavior, they do not consistently affect brain weight in the population studied.[16]

Similar results were observed in present study. In present study, cases where cause of death was hanging, weight of liver was increased in 14 (28%) of cases, in brain there was an increase in 8 (16%) of cases. Weight of lung was increased in 14(28%) of cases of hanging and that of kidneys in 12 (24%) of cases whereas spleen weight was increased in 25(50%) of cases of hanging. In cases where cause of death was poisoning, weight of liver was increased in 7 (14%) of cases, in brain there was an increase in 6 (12%) of cases. Weight of lung was increased in 7(14%) of cases of poisoning and that of kidneys in 6 (12%) of cases whereas spleen weight was increased in 9(18%) of cases of poisoning.

In a study on brain weight tested previously reported findings by Salib and Tadros that brain weight of fatal self-harm victims is higher than of those who died of natural causes were tested based on data from 15 suicides and 15 deaths of other causes. Data included matching variables of age, sex, time between death and postmortem examination, and temperature of the surrounding environment. The exploratory variables were brain weight and method of death. There were no significant difference between the brain weights of suicides and others. However, some differences were obtained for different suicide methods, which also differed in the temperature of the environment,

this being lower for the group of suicides that occurred outdoors (around or below 0 degrees C). On exclusion of all the outdoor cases and controls, a significantly higher brain weight was obtained for suicide cases. The researchers provided Respirator brain syndrome as described by Moseley, Molinari, and Walker in 1976 to be only a partial explanation for increased brain weight. Another possible suggestion provided is that higher brain weight in suicide victims may be related to previously demonstrated increased amygdala blood flow and subsequent amygdala enlargement due to the increased processing of emotional information.[17] These results coincides with result of present study. In present study cases where death were due to various suicidal methods (hanging, poisoning and burns), weight of liver, brain and kidneys were increased.

Similarly, in another study by brain weight of victims of fatal self harm was significantly higher than of those who died of natural causes.[15] This was true for all suicide methods but there was no difference between suicide modes.[18] It was reported in the study on 60 cases that died of hanging there was a slight increase in the brain weight.[18] This was supported by Hamilton and McMahon[16] who presented the brain weight of those who died by hanging to be significantly higher than those who died of natural causes or an overdose.

The majority of cases having increase in weight of internal organs in present study, cause of death are hanging followed by poisoning. This could be due to effects of asphyxiation and inflammation and irritation resulting in congestion and edema. Another study reported similar findings where the effects of asphyxiation when resulted in elevated mean organ weights for the lungs, liver, kidneys and spleen.[19]

5. Conclusion

Hanging was the most common method of suicide followed by poisoning and self immolation. The weights of internal organs were increased in majority of cases of suicides. These findings require critical examination and further research by including more data from younger age groups. There is need for a national and regional suicide neuro-pathological database.

6. Source of Funding

None.

7. Conflict of Interest

None.

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