

## Postmortem Prolactin Level may be an Indicator of Antemortem Stress: A Pilot Study

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### Abstract

**Objective:** To estimate postmortem prolactin levels in cases of completed suicides and find if the postmortem prolactin levels are raised and associated with antemortem stress in completed suicides.

**Material and Methods:** The present research was conducted in the Department of Forensic Medicine, Kasturba Medical College, Mangalore during May and July 2010. Postmortem blood samples were collected from the right femoral vein of male victims of suicide before the start of the autopsy and in vitro quantitative analysis of non-hemolysed blood sample was done using the principle of electrochemiluminescence.

**Results:** Most of the victims of suicide were aged between 30 and 49 years and hanging was the commonest method of suicide. Mean postmortem serum prolactin level was found to be marginally higher in suicidal deaths suggestive of a possible association of serum prolactin, stress and suicides.

**Conclusions:** The prolactin levels using postmortem blood samples in completed suicides were successfully determined. Our preliminary investigation is suggestive of a possible trend and an association of postmortem serum prolactin levels with antemortem stress and completed suicides. The association however is not strong and needs to be studied further in future studies.

**Keywords:** Suicides; Antemortem stress; Prolactin; Postmortem.

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### Introduction

Stress is inevitable in today's life. A relation between psychological stress and deliberate self-harm is well established. Every year over one million people commit suicide and around 10 to 20 million non-fatal attempted suicides are reported worldwide. The World Health Organization estimates completed suicides as the thirteenth-leading cause of death worldwide. [1]. According to National Crime Records Bureau (NCRB) report for the year 2006, over one lakh suicidal deaths occur in India every year. India alone contributes to

more than 10% of suicides in the world. The suicide rate in India has been increasing steadily and has reached 10.5 (per 100,000 of population) in 2006 registering a 67% increase over the rate reported in 1980. Psychiatric, biological, social and environmental factors place individuals at increased risk for suicide. Considering the subjectivity and complexity of human nature and individual reality, a logical explanation on causes of suicides needs a comprehensive analysis of views based on sociology, pathology, psychology, and biochemistry taken together. Neuro-endocrine alterations in a human body are one of the aspects of stress, which can set in pathophysiological sequence of changes [2]. It is difficult to avoid stress but we can prevent suicides as the results of stress, by the early diagnosis of signs and symptoms of suicides and specific intervention [3].

Prolactin is a hormone secreted by lactotrope cells situated in anterior pituitary gland. It is mainly responsible for lactation, sexual arousal, myelination of neurons,

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surfactant synthesis in fetal lungs in humans and is thought to play a significant role in human stress response. Previous studies have indicated an association between psychological stress and hyperprolactinaemia [4-8]. Though the relationship between stress and hyperprolactinaemia is known in the living, no study has established if a similar relation exists between antemortem stress and postmortem prolactin in cases of confirmed suicides. Scientific literature on the estimation of plasma prolactin level at autopsy is restricted to a study by Jones and Hallworth on the relation of antemortem physical stress in various causes of death including cases of fatal self-harm [7]. The present research studies the postmortem plasma prolactin levels in completed suicides and tests the hypothesis that postmortem hyperprolactinemia is related to antemortem stress. This preliminary investigation is done to find out the association between postmortem serum prolactin levels with suicidal behavior and find if postmortem prolactin levels are raised in completed suicides.

## Material and Methods

### *Study Setting*

The study was conducted in the Department of Forensic Medicine, Kasturba Medical College, Mangalore (Affiliated to Manipal University).

### *Study design*

A prospective autopsy based study for the biochemical estimation of serum prolactin in postmortem blood samples in completed suicides to find if postmortem prolactin levels are raised in completed suicides.

### *Study subjects*

Suicidal death among males autopsied at the Government District Wenlock Hospital

mortuary in Mangalore during the study period (May and July 2010).

## Methodology

An approval was taken from the Institutional ethical committee prior to conducting the study. Informed consent was obtained from the legal heirs of the victims before undertaking the research. Personal information along with the details of past clinical and drug history of the victims of suicide was collected from the relatives and hospital records if any. Autopsy findings and the information furnished by the investigating police officer into the cause and manner of death was recorded. All the information was put in a proforma. Postmortem blood samples were collected from the right femoral vein in cases of suicides for estimation of serum prolactin levels. Normal range of serum prolactin in males according to the chemiluminescence technology ranges between 4.8 and 15.2 ng/ml.

### *Inclusion criteria*

All adult male autopsy cases of suicide with a survival period of less than 12 hours and postmortem interval of less than 24 hours were included in the study.

### *Exclusion criteria*

Cases with other associated causes of hyperprolactinemia such as known pituitary disorders, systemic disorders (e.g. chronic renal failure, hypothyroidism, cirrhosis etc.) pregnancy, lactation, and history of intake of hyperprolactinemia causing drugs (e.g. Dopamine receptor blockers, H<sub>2</sub> blockers, tricyclic anti-depressants, estrogens, antiandrogens, opiates).

Cases with survival period of more than 12 hours and postmortem interval of more than 24 hours were excluded from the study. Hemolysed blood samples were excluded from the analysis.

*Statistical Analysis*

Statistical considerations could not be effectively applied owing to the small sample size of this preliminary time bound research project.

**Results**

All the victims of suicide included in the study were males aged between 21 and 60 years. Mean age of the victims was 39.10 ± 10 years. Maximum victims of suicides (80%) were in the 4th and 5th decade of life. 90% of the victims were married. Hanging was the preferred method of suicide (90 %) in most of

suffering from depression and stayed alone in his house, and another victim had killed his lover before hanging himself.

Serum prolactin levels in cases of suicides ranged from 6.3 – 34.0 ng/ml. Mean serum prolactin level among the cases was found to be 15.7±8.3 ng/ml. A mean serum prolactin level of 14.97±8.3 ng/ml was observed in the cases of suicidal hangings. Normal range of serum prolactin in males is 4.8 – 15.2 ng/ml. The serum prolactin levels in cases of suicides were arbitrarily grouped into three categories; less than 10 ng/ml, 10 to 15 ng/ml and more than 15 ng/ml, it is observed that only 20% of the suicidal victims had serum prolactin level < 10 ng/ml, 40% had a prolactin level between

**Table 1: Victim profile and postmortem prolactin levels in cases of suicide during the study period**

S no.	Age	Underlying cause	Method of suicide	Survival (hours)	Prolactin level (ng/ml)
1. *	49	Undetermined	Hanging	0	16.8
2.	30	Undetermined	Hanging	0	06.3
3. #	55	Chronic disease	Hanging	0	10.4
4.	39	Undetermined	Hanging	0	34.0
5.	31	Undetermined	Hanging	0	22.0
6. #	45	Financial instability	Hanging	0	09.5
7.	40	Depression	Hanging	0	10.2
8.	21	Undetermined	Poisoning	8	22.0
9.	36	Financial instability	Hanging	0	11.0
10	45	Undetermined	Hanging	0	14.5

Information on the underlying cause was based on the information furnished by the police and relatives at the time of autopsy

\* Killed his lover before hanging himself.

# Chronis Alcoholic

the victims included in the study. In the hanging cases, cotton cloth was the most commonly used ligature material (62.5 %), followed by nylon rope (25%) and synthetic saree material (12.5 %). It is observed that two victims committed suicide due to financial instability, one because of some chronic underlying pathology, and one of the victims was suffering from depression. In the remaining victims (n=6) the exact reason behind suicide remained unknown at the time of autopsy. Among the suicide victims, 2 victims were known alcohol addicts, 1 was

10 to 15 ng/ml and 40% had a serum prolactin levels > 15 ng/ml.

Victim profile and postmortem prolactin levels in cases of suicides during the study period are detailed in Table 1.

**Discussion**

Suicide in males is more common in most countries. Relationship between gender and suicide has been extensively researched. It is reported that males die much more often by

suicide than do females, although reported suicide attempts are more common among females. Males are considered to be at a higher risk of suicides considering the stress related to work and finances. Mostly males in the society earn a livelihood for their own families, so unemployed men often see themselves as failures and burden on their families. In addition, alcohol is a more common practice among males that makes them more vulnerable to suicidal attempts [9-14]. Most of the suicide victims included in the study had committed suicide by hanging. Hanging is the prevalent means of suicide in pre-industrial societies and is more common in rural than in urban areas. Hanging is a preferred method of suicide because it results in quick death and the approach is easy. All male victims of suicides with a survival period of less than 12 hours were included in the present study. The higher number of hanging victims in the present study is owed to the inclusion criteria of survival less than 12 hours. Victims opting for less lethal methods of suicides like poisoning and burns are very likely to survive for longer durations than hanging that immediately cause death in most cases. In the present study, most of the victims of suicide were in the 30-59 year age group. A study done in India indicates that the incidence of suicides is the highest in 30-44 year-old and tends to decline in higher age categories [15]. Most of the victims in our study were married, an observation similar to that reported in India. A study done in Italy showed that suicide rate among divorced and single men are significantly higher than that of married men [16].

Relation between stress and suicides is known. Stress is a major contributing cause behind suicides. In a study done to examine the associations between self-perceived stress and death from suicide among adult women, the risk of suicide was over eightfold among women reporting high stress compared with those reporting low stress [17]. Most common reason for suicides in the study was financial instability. Poverty may not be a direct cause but it can increase the risk of suicide, as it is a major risk group for depression [11]. Socio-

economic factors such as unemployment, poverty, homelessness, and discrimination may trigger suicidal thoughts [18]. Two victims of suicides in the study were alcohol addicts. In the United States 16.5% of suicides are related to alcohol [19]. Alcoholics are 5 to 20 times more likely to kill themselves while the misuse of other drugs increases the risk 10 to 20 times. Recent research has concluded that chronic excessive alcohol intake itself directly causes the development of major depressive disorder in a significant number of alcohol abusers [20]. In one case of suicide, the victim had killed his lover before restoring to hanging. One of the victims suffering from depression was staying alone in his house. An earlier study showed that middle-aged patients of deliberate self-harm who live alone appear to be particularly vulnerable to suicides [21].

Prolactin has a biological half-life of 20 minutes and remains stable in vitro for up to seven days at room temperature. Jones and Hallworth [7] in their study determined for the first time that plasma prolactin can be measured in blood taken at necropsy. Our study confirms their view on post-mortem analysis of plasma prolactin. Mean postmortem prolactin level in our study on completed suicides was marginally higher with 40% of the suicide victims showing raised post-mortem serum prolactin levels. In the only other study on the subject, Jones and Hallworth [7] studied the relation of antemortem physical stress in various causes of death including cases of fatal self-harm. They reported that prolactin was within the normal range in cases of death from trauma where death occurred very soon after the traumatic event. In sudden unexpected cardiac deaths the mean prolactin concentration was just above normal while mean prolactin in postoperative deaths and those from chronic disease was clearly raised. Some cases of suicides in their study had significantly raised values of serum prolactin. Their observations on serum prolactin in suicides were however influenced by effect of drugs. Our findings on plasma prolactin in hanging cases in the present study are similar to that observed in the hanging cases reported

by Jones and Hallworth [7] with an exception of higher levels in a hanging case where the female was on hormone replacement therapy in their study. It is presumed that suicide is the end result of unbearable stress. Relation between stress, suicides and prolactin however, is a complex multifactorial process. It may be argued that prolactin levels may not be raised in cases where suicide was an outcome of an event of acute stress. In view of the slightly higher mean plasma prolactin levels in postmortem blood samples in cases of suicides reported in the study, a possible association between postmortem serum prolactin levels with antemortem stress and completed suicides can be considered. The association however is not strong as reported in the earlier study [7].

### Conclusion

The prolactin levels using postmortem blood samples in completed suicides were successfully determined. The findings of our preliminary investigation are suggestive of a possible trend and an association of postmortem serum prolactin levels with antemortem stress and completed suicides.

Limitations in the study exist with regard to a small sample size and lack of statistical analysis. Limitations regarding small sample size are primarily owed to the time bound nature of research project supported by the Indian Council of Medical Research (ICMR) and secondarily due to the robust inclusion and exclusion criterion set in the study keeping in view the possible biases of increased physical stress if person survives for some time and the possibility of postmortem degradation of prolactin, biases on gender, and even the methods employed in suicides.

Considering the limitations of the study, future research on larger samples is suggested to confirm the findings of our preliminary investigation. It is suggested to correlate serum prolactin and stress levels in psychological autopsies for a better understanding of the association and reasons behind suicides.

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