

# Estimation of Postmortem Interval by Measuring Level of Potassium in Cadaveric Synovial Fluid

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## Abstract

**Background-** In the present study analysis of changes in level of potassium in cadaveric synovial fluid is done, which is correlated with increasing postmortem interval and this study have not been done in south east region of Rajasthan so far.

**Methods-** This study was carried out in department of Biochemistry in association with department of Forensic Medicine and Toxicology, Jhalawar Medical College, Jhalawar. This study was done on 50 cases with known time of death who was brought in the mortuary of department of Forensic medicine and Toxicology for autopsy. The information regarding time of death were collected from hospital records. Ethical permission has been taken from college ethical committee.

**Results-** In this study it was observed that there is considerable rise in the synovial potassium level with increasing postmortem interval (Statistically significant positive correlation). The rise of synovial potassium ion concentration varied from 3.90 to 14.70 mEq/l. This linear relationship of the increase in synovial potassium concentration with increase postmortem interval is both arithmetic and as well as logarithmic. So potassium ion level in synovial fluid is one of the most accurate method of estimating postmortem interval

**Conclusion-** We have observed statistically significant linear rise of potassium ion concentration in synovial fluid.

**Keywords-** Potassium, Death, Postmortem.

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## I. Introduction

Postmortem interval is the time between the death and of postmortem examination of a dead body. This is important in knowing when the crime was committed.

Accurate determination of time since death is one of the most vital and yet one of the most difficult problem in medical field<sup>1</sup>. Postmortem interval can be calculated from taking into consideration many factors like physical changes after death such as rigor mortis, postmortem staining, body temperature, greenish discoloration of right iliac fossa, changes in eyes, contents of stomach and bladder and modified form of decomposition like adipocere and mummification<sup>2</sup>. Postmortem chemical changes start to occur in the body immediately or shortly after death and progress until the body disintegrates. Each change has its own time factor and rate. These changes occur in various body fluids including blood, cerebrospinal fluid, synovial fluid and vitreous humour etc. So determination of the chemical abnormalities could help autopsy surgeon to ascertain time since death more precisely<sup>3</sup>. Hence forensic experts and biochemists have been concentrating on biochemical changes that occur in body fluids such as blood and compartmental fluids like vitreous humour, synovial fluid, cerebrospinal fluid, pleural fluid and pericardial fluid. The ideal sample for chemical analysis for the estimation of postmortem interval should be stable, inert, easy to obtain, well protected from bacterial contamination and should have slow rate of decomposition.

## II. Materials And Methods

This study was carried out in department of Biochemistry in association with department of Forensic Medicine and Toxicology, Jhalawar Medical College, Jhalawar. This study was done on 50 cases with known time of death who was brought in the mortuary of department of Forensic medicine and Toxicology for autopsy. The information regarding time of death were collected from hospital records. Ethical permission has been taken from college ethical committee.

The exclusion criteria were:-

All the cases where the time of that was unknown.

Body in advanced stage of decomposition.

The extracted sample is cloudy, turbid or hemorrhagic in nature.

Cases of joint disease/deformity. (Osteoarthritis, Rheumatoid arthritis etc)

Cases of knee joint injury.

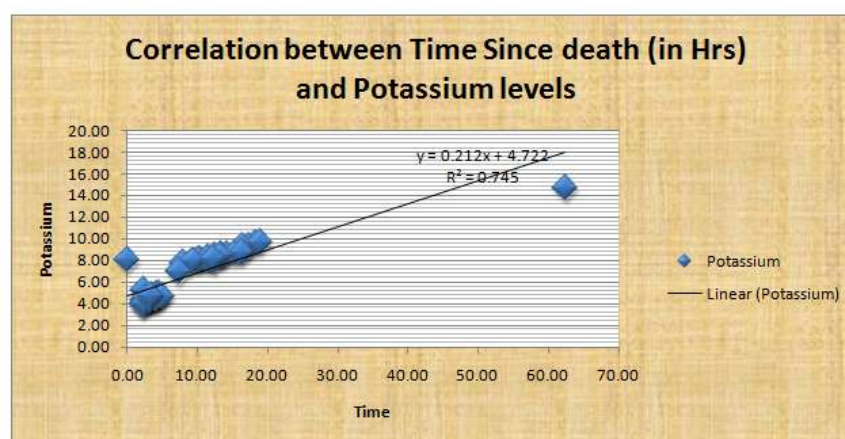
When amount is less than 0.5 ml.

In present study Synovial fluid samples were obtained from both knee joint should be examined immediately or within a few hours after arthrocentesis<sup>4,5</sup>. So the sample were immediately sent to Biochemistry lab for analysis. Samples were analysed on BECKMAN COULTER AUTOANALYZER. If immediate analysis was not possible then the samples were stored at 4 degree centigrade for analysis on the very next working day.

## III. Observations And Results

**Table 1:** Correlation between Time since death (in Hrs) and Potassium

	Mean	Std. deviation	N	r value	P value
Time Since death (Hrs)	9.1192	9.35234	50		
Potassium Right	6.6700	2.31298	50	0.869	<0.0001*
Potassium Left	6.6520	2.29420	50	0.857	<0.0001*
Potassium	6.6610	2.303.2	50	0.863	<0.0001*



## IV. Discussion

One of the commonest requirements of postmortem examination is determination of postmortem intervals. Estimation of time since death helps in including and excluding the suspects and culprits and in conforming the statement of suspects. It is also useful in civil cases such as inheritance of property, insurance claims etc. Vitreous humour chemistry is used for postmortem analysis since serum values of many components are thought to be reflected in vitreous humour and to be stable for a prolonged postmortem interval. A similar isolated compartment to vitreous humour is synovial fluid which up to now was hardly used for postmortem chemistry<sup>6</sup>. As synovial fluid is more protected and less prone to burns or atmospheric variations in comparison to other body fluids. Synovial fluid might be helpful in estimating postmortem interval with much desired accuracy.

In this study it was observed that there is a considerable rise in the synovial potassium level with increasing postmortem interval (Statistically significant positive correlation). The rise of synovial potassium ion concentration varied from 3.90 to 14.70 mEq/l. This linear relationship of the increase in synovial potassium concentration with increase postmortem interval is both arithmetic and as well as logarithmic. So potassium ion level in synovial fluid is one of the most accurate methods of estimating postmortem interval. This

observation is supported by many other workers including Madea<sup>3</sup> et al (2001), Swaine R Krishna<sup>7</sup> PC et al, Sheikh<sup>2</sup> NA (2007), Tumram<sup>8</sup> et al (2014), Siddhamsetty<sup>9</sup> AK et al (2014), Angayarkanni<sup>10</sup>S (2016) and Surender<sup>12</sup> et al (2018). Our study differs with Madea<sup>3</sup>B et al (2001), Sheikh<sup>3</sup> NA (2008) and Tumram<sup>9</sup> et al (2011) who did not find any correlation of sodium Ion.

## V. Conclusion

We have observed statistically significant linear rise of potassium ion concentration in synovial fluid.

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