

## A study of correlation between vitreous potassium level and post mortem interval

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### Abstract

Present study was undertaken to study the correlation of potassium level of vitreous humor with time since death. Vitreous was collected from 150 medicolegal autopsy cases between August 2000 to March 2001 in Bharatpur Hospital, Bharatpur, Chitwan, Nepal. There was a linear increase in vitreous potassium level with rise of postmortem interval. This indicates that rise in potassium levels after death has a strong correlation with the PMI.

**Key words:** Vitreous humor, Potassium, Post-mortem interval (PMI)

Vitreous humor is an inert, transparent, jelly like structure that fills the posterior four fifths of the cavity of eyeball. It is a hydrophilic substance that serves the optical functions during lifetime and helps in assessing post-mortem interval (PMI) after death.

Jaffe (1962) first noted that potassium increase in the vitreous humor in a regular fashion and the average rate of rise was 0.17mEq/hr<sup>2</sup>. Blumenfield (1974) reported a linear increase of potassium concentration in relation to PMI<sup>6</sup>. Govekar (1997) reported that there is a linear rise of potassium values ranging from 3.56 mEq/L to 15.5 mEq/L.<sup>13</sup>.

Time since death or PMI is of utmost importance in the investigation of crime, but unfortunately in Nepal, there is no well developed forensic laboratory to give conclusive report on PMI. An investigator has to rely on history given by relatives or policeman and postmortem room examination findings, which are not always correct and precise. This comprehensive study was, therefore, sought to know correctly the PMI, which is a very important part of any forensic investigation. This study was undertaken to study the level of potassium in vitreous humor at different intervals after death and to study its correlation with time since death.

### Materials and methods

Present study was done on 150 bodies brought for autopsy during August 2000 to March 2001 in Bharatpur Hospital, Bharatpur, Chitwan, Nepal. Time of death was recorded from relatives or police personnel.

2ml. Of vitreous was aspirated from the eye with a 21 gauge needle in a 5ml syringe from the outer canthus. After obtaining vitreous, the empty vitreous cavity was refilled with normal saline to maintain the shape of eyeball. Estimation of potassium in the vitreous was done in the department of biochemistry, College of Medical Sciences, Bharatpur, Nepal by the flame photometry method. Details of the dead body, particularly time of death was kept confidential to avoid any bias in results.

All the dead bodies were grouped in six groups based upon PMI. Formal permission from concerned authorities were obtained. Group I included cases with PMI of 0 – 6 hrs, group II included those with PMI of 6 – 12 hrs, group III included those with PMI of 12 – 18 hrs, group IV included those cases with PMI of 18 – 30 hrs, group V included those with PMI 30 – 42 hrs and group VI included those cases with PMI of more than 42 hrs.

### Results

Out of 150 cases under study, 92 were males and 58 females. Average overall age at presentation was 34±10 years. Vitreous potassium level in group I cases was 5.1 mEq/l, in group II it was 5.5, in group III it was 6.4, in group IV it was 6.4, in group V it was 9.2 and in group VI it was 9.4 mEq/L. group I included 18 cases, group II included 18 cases, group

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III included 42 cases, Group IV included 23 cases, group V included 13 cases and group VI included 36 cases.

It was observed that rise in vitreous potassium level after death hold a strong correlation with the time since death irrespective of the cause of death.

**Table 1.** Potassium level in various groups

Group	PMI (In Hours)	Potassium Level (m Eq/L)
I	0 – 6	5.1
II	6 – 12	5.5
III	12 – 18	6.4
IV	18 – 30	6.9
V	30 – 42	9.2
VI	> 42	9.4

### Discussion

During lifetime potassium is almost intracellular. High intracellular concentration of potassium is maintained by sodium potassium pump. After death this sodium potassium pump doesn't operate, therefore potassium is leaked out of cell, leading to high postmortem levels.

Post mortem potassium level has been studied in various body fluids by many workers. Jetter (1959) reported marked increase in blood potassium (upto 18 m Eq/L) within 1 hour of death<sup>1</sup>. Munoz and Hardynsky (1958) did not find any significant correlation of potassium level in cerebrospinal fluid in relation to time of death.

In vitreous humor, Jaffee (1962), Hanson (1966)<sup>4</sup>, Leay<sup>3</sup> and Farber (1967), Coe (1969)<sup>5</sup> and Blumanfield (1974) noted that potassium level increased in a regular fashion and average rate of rise was 0.17 m Eq/L.

Similar reports were given in the works of Greasone Z and co-workers (1987)<sup>7</sup>, Stephens RJ and Richards RG (1987)<sup>8</sup>, Medea B and co-workers (1989 and 1990)<sup>9</sup>, Lang N and co-workers (1994)<sup>10</sup>, James RA and co-workers (1997)<sup>11</sup>, Gong Z Q et al (2001) and Munoz Basus JI et al (2002)<sup>12</sup>.

In present study, linear increase of vitreous humor potassium level with rise in time since death is observed. Average rate of increase of vitreous potassium was calculated as 0.21 m Eq/L. which is comparable to the findings of other workers.

Although various workers have given various formulas to derive time of death from vitreous potassium levels, any arithmetic formula cannot be

derived from present study. Also, effect of cause of death on vitreous potassium level has not been emphasized in present study, which is an important aspect of medicolegal investigations.

### Conclusion

Present study concludes that there is a linear rise in vitreous potassium level after death which is helpful in estimating postmortem interval.

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## Announcement

It is customary for HO position at KMC Teaching Hospital to start on 1<sup>st</sup> Baisakh & 1<sup>st</sup> Kartik B.S. every year. Interviews for positions will be held about 15 days prior to this viz., 1<sup>st</sup> April & 1<sup>st</sup> October A.D. Applications should state:

1. Post applied for (HO). Two departmental preferences in terms of priority.
2. Photocopies of academic certificates from SLC.
3. Certificate of registration by NMC.
4. Certificate regarding previous posts and recommendations if any.

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NB: Doctors with postgraduate qualifications, who are interested in joining Kathmandu Medical College, should enquire regarding existing vacancies.