POSTMORTEM BLOOD GLUCOSE LEVEL: HOW USEFUL TO ENVISAGE THE TIME SINCE DEATH

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ABSTRACT

Background: *Estimating the time since death is one of the prime objectives of conducting Medico-legal autopsies. The exact time of death can be known from hospital records, police investigation report etc. But at times, it is difficult to predict when such records are not available. Various methods have been experimented using biological fluids like blood, vitreous humor, synovial fluid, urine etc. to determine time lapse with varying degree of success. After somatic death, blood components undergo biochemical changes at every tissue. This principle can be utilized effectively to predict time since death in routine forensic practice where time of death is uncertain.*
Study purpose/Objectives: *The present study was conducted to evaluate the relationship of postmortem blood glucose level with time elapsed from death on thirty-nine postmortem blood samples of time registered deaths of an adult occurred at our hospital.*
Methods: *The 10 ml of jugular venous blood was collected from each autopsy case. Blood glucose level was estimated by glucometer. The results were correlated with time since death.*
Results and Mean Findings: *Significant difference between blood glucose level before death (125.32 ± 489.29) and after death (56.73 ± 42.00) was observed. When the time interval since death (884.11 ± 489.29 min)were compared with difference in blood glucose level (68.59 ± 57.76mg/dl) shows high significance (p<0.0001). Similar significance (p<0.0001) were noted when the time interval since death were compared with rate of fall (0.103 ± 0.093 mg/dl min) of glucose level.*
Conclusions: *Estimation of postmortem blood glucose level doesn't provide any specific pattern of fall. Hence, it cannot be recommended for estimation of time since death as individual parameter.*

Keywords: *Postmortem blood glucose, time since death.*

INTRODUCTION

Estimating the time lapsed from death is one of the prime objectives of conducting Medico-legal autopsies. The exact time of death can be known from hospital records, police investigation report etc. when available but, at times, it is difficult in situations of dead bodies lying on the spot for some time may be for hours, days or even weeks, before coming to the notice.[1] The postmortem interval helps in knowing the time of fatal event, gives a starting point for investigation to the police or it might enable to exclude some suspects from the site.[2] Exact time of death cannot be fixed by any one method, but only an appropriate range of time of death can be given. It becomes still difficult as the death time interval outdoes.

The biological fluids like CSF, blood, vitreous humor, pericardial fluid and synovial fluid have been utilized by researchers for reliability of accurate post mortem interval. Post mortem levels of electrolytes and their property to change with time had been used worldwide. According to published literature, blood components undergo degradative changes after somatic death and their value alter with the time of death. This principle can be utilized effectively to predict time since death in routine forensic practice where time of death is uncertain. In case of blood glucose levels, there are factors which influence their level after death, such factors may either increase or decrease blood glucose level after death.[3]

Fekete J F and Kerenyi N A[3] reported an initial study on calculating the postmortem blood sugar and blood urea nitrogen to diagnose the diabetes and uremia at the autopsy. They calculated blood glucose level which ranged from 7.5 to

472 mg% among the 160 total samples. It was first time reported by Fekete J F that, the infants under 3 months of age had shown significantly higher postmortem blood glucose level than normal adults. Further, they concluded that no correlation could be estimated in relation to time lapsed after first 36 hours of death and blood sugar level. Hamilton-Paterson and Johnson[4] demonstrated for the first time in forensic literature that, glycolysis plays important role in lowering the blood glucose level especially, when postmortem blood collected from peripheral vessels, whereas blood drawn from right atrium commonly have high blood glucose values.

Hill[5] in his work of experimental animals proved three significant points that elevated postmortem blood glucose level in right atrium was probably a result of glycogenolysis occurring in the liver, glycolysis occurred at same rate in-vivo and in-vitro (approx. 12.8 mg% per hour) and asphyxia would produce marked rise in sugar level. In contrast to Hill's[5] observations, Tonge and Wannan[6] found that, rates of glycolysis in vivo and vitro were different so that appreciable glucose levels were detectable even after 60 hours of death.

Though there are number of studies on glucose level in postmortem blood sample to predict time since death many are differing in their opinion. In the present study, we made an attempt to correlate the reliability of postmortem blood glucose level in approximating time elapse form death on known death time registered cases attended for autopsy at our hospital mortuary.

MATERIAL AND METHODS

The present study was conducted in the Department of Biochemistry in collaboration with Department of Forensic Medicine, SDM College of Medical Sciences and hospital, Dharwad, over a period of 20 months, from November 2010 to June 2012. It includes data from 39 autopsy blood samples attended at our hospital. The hospital death cases having known time of death were considered in the study. Brought dead and cases with history of hyperglycemia, hypertension, cardiovascular disease, burn and patients with long term steroid intake were excluded.

External jugular vein was selected as the site of blood collection and 10 ml of blood was collected at beginning of dissection in each case. Blood glucose levels were estimated by using digital blood glucose analyzer (Medisense- Optimum) at the side, after taking proper precautions. The readings were repeated by Glucose oxidase method at department of biochemistry as a confirmation. The blood glucose level reading and the exact time of result were recorded in study pro-forma. The blood glucose level and the time of collection of sample before death were noted from the hospital records. Permission for the present study was obtained from Institutional ethics and research committee of our college.

RESULTS

Table 1: Shows Demographic Data of the Cases Included in the Study Population

Total number of cases (n)	32
Male	27
Female	05
Minimum age in years	21
Maximum age in years	70
Cases of road accidents	30
Cases of any type of poison	09
Cases excluded due to laps in data	11

From total 39 selected cases, 11 cases were excluded from the study because of unavailability of required data. Out of 32 remaining cases under study, 27(84.36%) were male and 05 (15.63%) were of female. Their age ranged from 21 to 70 years (mean age 40yrs with SD ±15.7, and median 32.5yrs). Again based on the cause of death category out of 32 cases 30

(93.75%) cases were victims of fatal road traffic accidents and 09 (28.13%) deaths were due to consumption of some poison. Autopsies in all the cases were conducted within 48 hours of death.

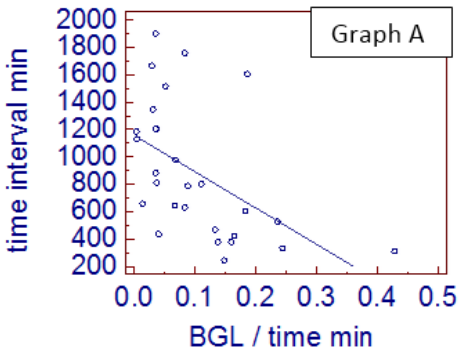
Table 2: Time since death and blood glucose levels

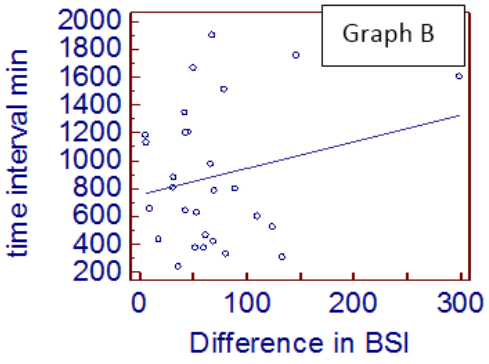
	Time interval since death (T) min	BlGlu before death mg/dl	Blood glucose level on time of postmortem mg/dl	Difference in Blood glucose level Before death and time of postmortem (DBGL)mg/dl	Rate of Blood glucose fall DBGL / T mg/dl min
No of observations	28	28	28	28	28
Lowest value	240.00	75	10.00	5.25	0.004
Highest value	1900.00	310	155.00	298.70	0.429
Mean	884.11	125.32	56.73	68.59	0.103
SD	489.29	46.40	42.00	57.76	0.093
Median	792.50	45.50	46.14	56.56	0.076
95% CI	551.89 – 1165.28	167.33 – 143.32	40.44 – 73.01	46.20 - 90.99	0.374 – 0.136
P				P<0.0001 S	P<0.0001 S

S= significant

Table no 2 shows there is significant difference between blood glucose levels before death (125.32 ± 489.29) and performed on autopsy sample (56.73 ± 42.00). When the lapse of time interval (884.11 ± 489.29 min) since death were compared with difference in blood glucose level (68.59 ± 57.76mg/dl) it has shown high significance (p<0.0001). The time interval since death when compared with rate of fall of glucose level remained highly significant (p<0.0001).

On regression correlation of the time interval since death with fall of blood glucose level (graph A) shows moderate negative correlation (r= -0.56), On the other hand regression correlation of the time interval since death with difference in blood glucose level (graph B)shows significant but mild positive correlation. (r = 0.22)





DISCUSSION

Present study demonstrates the fall in blood glucose level in postmortem samples. The probable reason can be attributed to the fact that metabolic reactions continues after somatic death of an individual and glycolysis affects the postmortem blood glucose level in peripherally collected blood. Our study is in agreement with the results of Hill[5] Hamilton-Paterson and Johnson[4]. However it contradicts the finding of postmortem breakdown of carbohydrates in the gastro-intestinal tract which would have increased the blood glucose level.[7] Calculated rate of fall of glucose level with time in minutes of autopsies samples, shows curvilinear orrelation. On comparing this finding with published literature, it agrees the fact that blood glucose level fluctuates after death and various other independent factors are associated[6]. There is no specific pattern of decrease to correlate with the lapse of time since death.

CONCLUSION

Estimation of postmortem blood glucose level doesn't provide any specific pattern of fall. Hence, it cannot be recommended for estimation of time since death as individual parameter.

As present study was performed on limited sample size and the site of sample collection i.e. jugular vein selected may provide some lacuna in our study. However, similar type of study utilizing the vitreous sample or blood sample from atrium may be recommended.

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