

Effect of Storage on Biochemical Parameters

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Abstract: This study was carried out to investigate the effect of storage on biochemical parameters. Samples were analysed after collection and after 24 hours of storage at 2-8°C. Total of 30 apparently healthy subjects were selected for the study. Blood samples were collected for estimation of parameters such as Glucose, Urea, Creatinine, ALT, AST, Alkaline Phosphatase, Total Bilirubin, Direct Bilirubin, Total Protein, Albumin, Gamma Glutamyl Transferase, Lactate Dehydrogenase, Calcium, Sodium, Potassium and Chloride. Samples were analysed on the day of collection and after storage for 24 hours at 2-8°C. Paired t test was used for statistical analysis. Extreme statistical significance was observed for parameters such as Glucose, Urea, Creatinine, LDH, ALT and AST with p value < 0.0001. The other parameters like ALP, GGT, Total protein, Albumin, Total bilirubin, direct bilirubin, Calcium, Sodium, Potassium and Chloride did not show any statistically significant difference. Based on the results we can conclude that storage affects values of certain biochemical parameters.

Keywords: Biochemical parameters, Storage, Samples, Temperature, Analysis

INTRODUCTION

Laboratory tests are used for screening, diagnosis and monitoring the prognosis of patients with different ailments. The samples need to be transported from the place of collection to the laboratory for analysis. Sometimes the parameters need to be repeated for confirming the previous results or the clinician requests for more tests to be done on the same sample.

Hence samples need to be stored for analysis later. Factors like preanalytical and analytical or normal biological variations may affect the accuracy of test result. To obtain laboratory data that reflects patient's exact pathophysiological condition, preanalytical and post analytical processes should be checked and must be reduced to acceptable levels at which they do not cause an impact on clinical interpretation of the test results [1].

AIM

The aim of the study was to find out if sample storage for 24 hours at 2 – 8° C would have any significant alteration in the routine biochemical parameters such as Glucose, Urea, Creatinine, ALT, AST, Alkaline Phosphatase, Total Bilirubin, Direct Bilirubin, Total Protein, Albumin, Gamma Glutamyl Transferase, Lactate Dehydrogenase, Calcium, Sodium, Potassium and Chloride.

MATERIALS AND METHODS

This is an observational study conducted at the Department of Biochemistry, Central Laboratory, Sree Balaji Medical College and Hospital, Chrompet,

Chennai. 30 apparently healthy individuals in the age group of 18-60 years were chosen for the study. Samples for glucose were collected in grey topped fluoride oxalate vacuum tube and samples for other biochemical parameters in red topped plain vacuum tube. The samples were centrifuged at 3000 rpm for 15 minutes. The samples were then analysed in Mindray BS 390 automated analyser. The values were noted and were found to be in the reference range. The samples were stored in 2-8°C for 24 hours. After 24 hours, the stored samples were reanalysed for the same biochemical parameters. The data were analysed using SPSS-18. Paired t test was used to analyse the difference between the biochemical parameters on the day of collection and after 24 hours of storage. The mean value of the paired differences and standard deviation were calculated for each analyte and was tested for significance by paired t test.

RESULTS

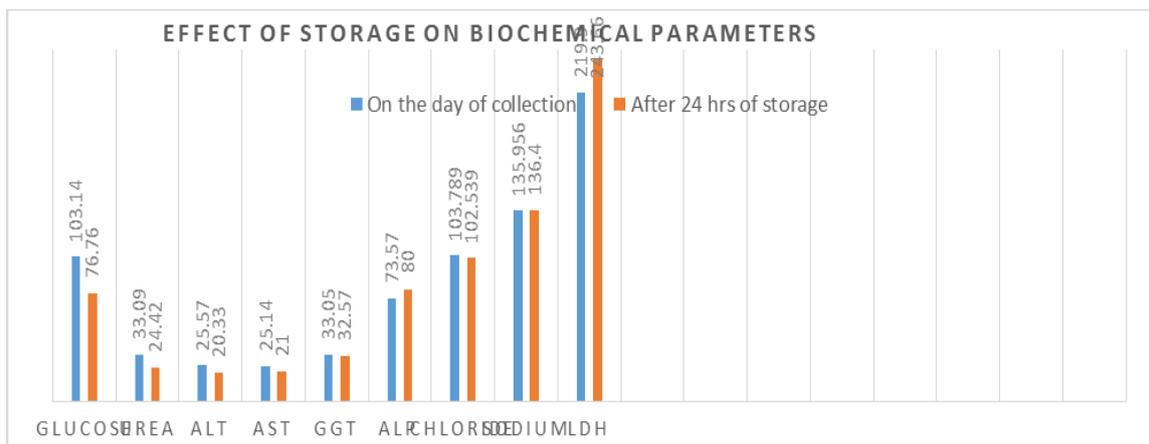
The mean values of all the parameters on the day of collection and after 24 hours of storage are given in this Table-1.

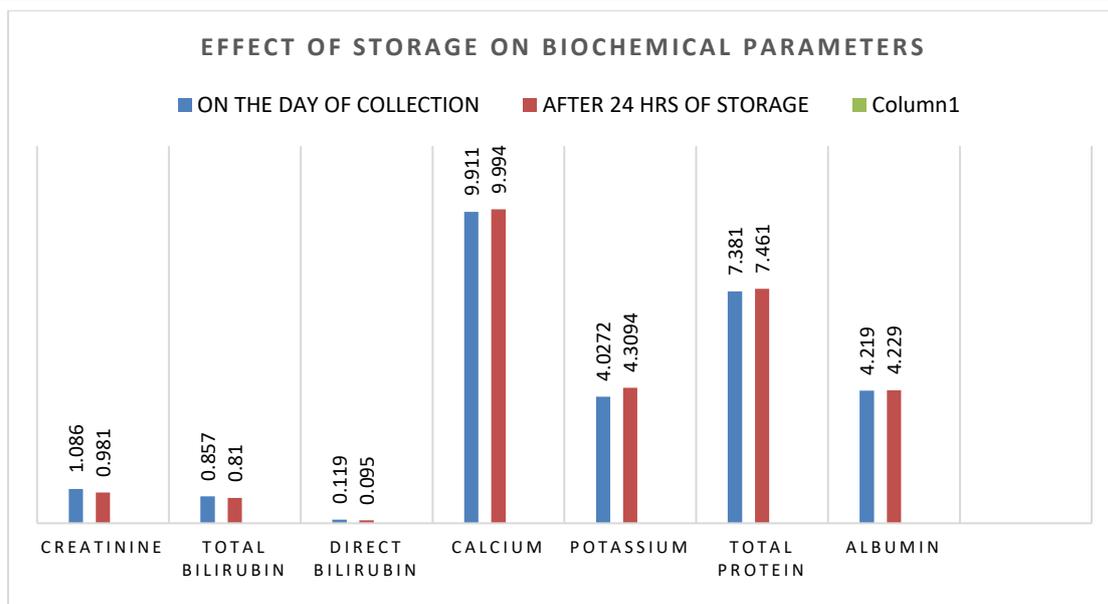
Extreme statistical significance was observed for parameters such as Glucose, Urea, Creatinine, LDH, ALT and AST with p value < 0.0001. The other parameters like ALP, GGT, Total protein, Albumin,

Total bilirubin, direct bilirubin, Calcium, Sodium, Potassium and Chloride did not show any statistically significant difference.

Table-1: The mean values of all the parameters on the day of collection and after 24 hours of storage

BIOCHEMICAL PARAMETERS (n=30)	DAY OF COLLECTION Mean ± SD	AFTER 24 HOURS OF STORAGE Mean ± SD	'p' VALUE
GLUCOSE	103.14 ± 18.61	76.76 ± 22.37	0.0001
UREA	33.1 ± 5.28	24.43 ± 5.27	0.0001
CREATININE	1.086 ± 0.188	0.981 ± 0.202	0.0001
ALT	25.57 ± 7.77	20.33 ± 6.66	0.0001
AST	25.14 ± 8.92	21 ± 9.33	0.0001
ALP	73.57 ± 17.79	80 ± 21.33	0.015
TOTAL BILIRUBIN	0.857 ± 0.279	0.81 ± 0.228	0.0565
DIRECT BILIRUBIN	0.119 ± 0.108	0.095 ± 0.097	0.0212
GGT	33.05 ± 9.39	32.57 ± 9.51	0.04
LDH	219.19 ± 45.5	243.67 ± 151.36	<0.0001
CALCIUM	9.911 ± 0.469	9.994 ± 0.499	0.6089
SODIUM	135.956 ± 2.417	136.4 ± 2.439	0.5865
POTASSIUM	4.0272 ± 0.5001	4.3094 ± 0.4243	0.0767
CHLORIDE	103.789 ± 1.132	102.539 ± 0.980	0.0012
TOTAL PROTEIN	7.381 ± 0.856	7.461 ± 0.849	0.1428
ALBUMIN	4.219 ± 0.541	4.229 ± 0.555	0.091





DISCUSSION

The Clinical and Laboratory Standards Institute recommends that the serum samples must be separated within 2 hours of collection for most of the analytes and that temperature may affect the stability of some analyses [2]. Our study was done to show the effect of storage and temperature on biochemical parameters. It was observed that some analytes showed a decrease in value, others an increase in value while others remained constant. In the current study, it was observed that there was a statistically significant difference noticed after storage in Glucose, Urea, Creatinine, ALT, AST and LDH which is consistent with the findings by Marjani *et al.* [1]. Other parameters did not have any statistically significant variation which implies storage did not affect the stability of these analytes. Similar observations were made by Dongbo *et al.* [3].

The study done by J.D. Morris *et al.*[4]. Showed significant changes in potassium as well after 48 hours of storage which is contradicting to our observation. Similar study was done by Donnelly *et al.*[5], who investigated the stability of 25 analytes wherein he showed that sodium, potassium and chloride remain stable for 24 h at room temperature, and even at 4 °C and -20° C. Bobby *et al*[6], who investigated the stability of 24 analytes after prolonged contact of plasma and serum with blood cells and after immediate separation of plasma and serum at room temperature (25°C) and analysed in 0,2,4,8,16,24,32,40,48 and 56 hours after collection of samples found that sodium, potassium and chloride remained stable up to 56 hours. In the study by Heins *at al.* [7], who performed stability studies on 22 serum analytes it was observed that electrolytes remained stable after 24 hours. However, similar study by Tanner *et al.* [8], on 30 adult healthy

volunteers on 35 analytes showed that stability of potassium is altered within 24 hours but sodium remains stable up to 24 hours.

CONCLUSION

The above study shows that storage affects the values of parameters such as Glucose, Urea, Creatinine, ALT, AST and Lactate Dehydrogenase. There is a significant alteration in the key biochemical parameters. Proper blood sampling processing is required to obtain accurate biochemical reports. Hence it is recommended that the samples be analysed soon after collection. Otherwise proper storage and temperature must be ensured after specimen collection to avoid misleading results.

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