

## TEMPERATURE REGULATION OF CBC SAMPLES IN CLINICAL LABORATORIES OF KARACHI

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### ABSTRACT

To determine how Labs are maintaining their Laboratory temperatures, To measure the temperature of different clinical laboratories & to check their controls, to compare temperature affects on Samples & Controls with normal values & with each others. In a cross-sectional study, fifteen clinical laboratories in Karachi are examined for observing the standard protocols for running a lab with particular reference to temperature regulation. A questionnaire to the effect is filled and data are statistically analyzed and the following results are obtained. In the 15 labs observed, the mean of complete blood counts performed daily was  $1.93 \pm 0.88$ . All 15 (100%) labs had a temperature reader. All 15 (100%) labs had an air-conditioner installed. Out of these 15, only 12 were found to be in working condition. Out of 15 laboratories 8 (53.3%) of them perform the sample immediately, 2 of the laboratories (13.3%) perform after half an hour, 3 (26.6) perform within 1 hour while 1 (6%) takes more than 1 hour to perform the sample. The finding of this survey showed that some of CBC parameters can be changed with the variation in temperature; therefore it is better to do the CBC test after blood taking as soon as possible. So, the commercial laboratories should be properly registered and their quality standardized.

### KEY WORDS

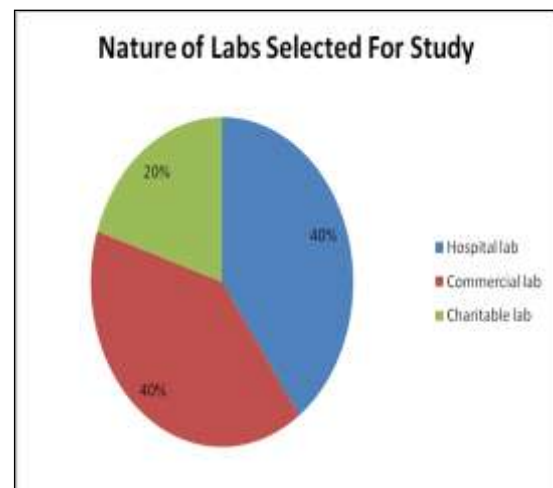
CBC (Complete blood count), RBC indices (Red blood cell Indices), Temperature of storage, Time of storage, Calibration, Temperature, Thermometer, Water baths.

### INTRODUCTION

In clinical laboratories, the cycles of each test starts with the preparation of patient, and continues with biologic sample collection, preparation and incubation the sample in suitable conditions (temperature) and finally finishes by reporting the result. (Cowan, 2005) It is sometimes necessary to redo a test to obtain a reliable result. Sometimes there is a period of time between sample collection and doing or redoing a test (Tarar, 2002) In this situation the stability of the samples is very important. Since blood tests are more common than the other biologic fluids, therefore using the standard methods for sample collection, incubation and the role of environmental factors that affect the blood's indices should be considered (Cowan, 2005). Precise temperature control is an absolute necessity in many clinical settings. In clinical laboratory, many specimens are stored in refrigerators or freezer. Refrigerators & freezers should be maintained as per manufacturer guidelines & temperature checks documented (Sarwar, 2006) Accurate calibrated thermometers can be used to verify the accuracy of thermometer used in laboratory. The environmental temperature of the laboratory also raised question about reliability of tests results. The temperature should be maintained at required standard for performing test (Adil, 2005; Zhang, 2004 & Högman, 1999) whether it is the room temperature, temperature of water bath, refrigerators & air-conditions. A temperature reader should be available to make the regulation of temperature easy for the laboratory workers. Incubators (dry/water) is also used to bring the samples/reagents mixture to proper temperature & maintain it at a proper temperature for amount of time determined necessary for a reaction to take places (Cowan, 2005). Complete blood count (CBC) is one of the most common and routine laboratory tests that is the first step to diagnose an illness and since this test is become easy and quick, it can give valuable information to the physicians (Cowan, 2005) The results of CBC can be affected by different factors such as the temperature and incubation period. In another study it has been demonstrated that incubation of blood samples in different temperature leads to considerable alteration in blood cells and red blood cells (RBCs) indices so there should be a complete understanding of how temperature irregularity may affect the laboratory results (Mujeeb, 2006). It is suggested that every laboratories should have written protocol for temperature regulation & acceptable temperature controller storage area must be recorded.

### METHOD

The study is a cross sectional survey carried out between September and December 2008. Informed consent was obtained from the laboratory Incharge. Fifteen busy laboratories of Karachi were included, of these 6 were hospital based, 6 commercial and 3 charity laboratories.



Data was collected through a questionnaire. The laboratories were visited during working hours and practices were observed. Data was analyzed by SPSS version 16.

### RESULTS

In the 15 labs observed, the mean of complete blood counts performed daily was  $1.93 \pm 0.88$ . All 15 (100%) labs had a temperature reader. All 15 (100%) labs had an air-conditioner installed. Out of these 15, only 12 were found to be in working condition.

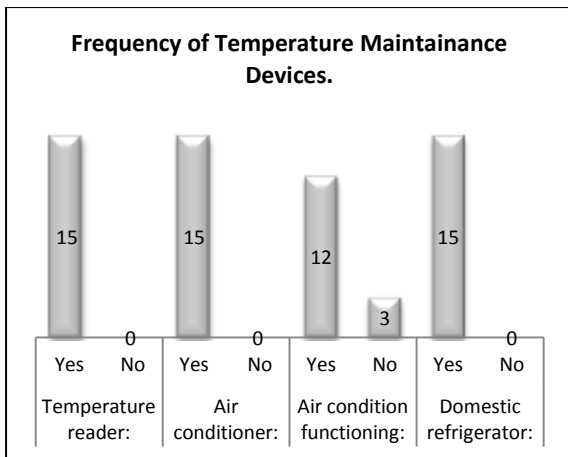


Figure 1: The data shown represents the frequency of temperature maintenance devices.

Out of 15 laboratories 8 (53.3%) of them perform the sample immediately, 2 of the laboratories (13.3%) perform after half an hour, 3 (26.6) perform within 1 hour while 1 (6%) takes more than 1 hour to perform the sample. Control was available in all (100%) labs, but this was used daily in 13 (86.6%) labs and 2 (13.3%) of them uses it when problem arises.

Quantity of blood was the same in all the tubes in only 10 (66.6%) labs and in 5 (33.3%) labs quantity was variable. Room temperature in these labs was  $21.47 \pm 2.32$  °C.

The purpose of this study was to examine the temperature regulation and standardization practices of clinical laboratories in Karachi. The study suggests that standard operating procedures were being followed in the major clinical laboratories in Karachi. Alternative power supply was available in all 15 (100%) labs (Petersen, 1996) which make sure that the composition of the chemicals and blood samples under analysis give authentic results.

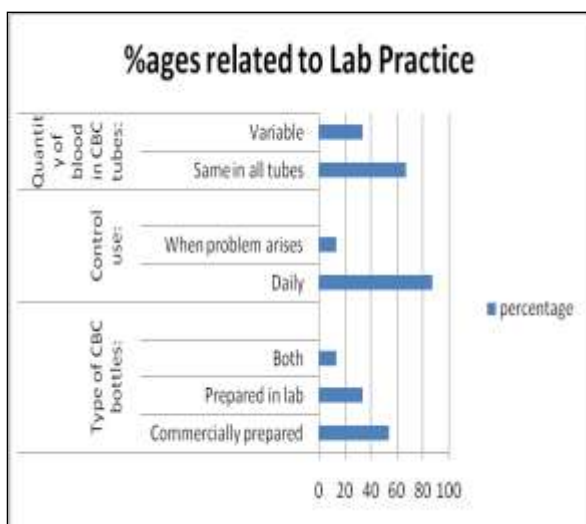


Figure 2: The data shown represents the percentages related to lab practice.

All laboratories should be properly registered and their quality standardized. The results of this study show that most of the laboratories follow standardization procedures for the storage and performance of CBC samples. The results of these labs should be frequently checked and further enhanced time to time to ensure quality of results.

	Mean $\pm$ SD	Range
No. of CBC per day	1.93 $\pm$ 0.88	50 – 200
Room temperature (centigrade)	21.47 $\pm$ 2.32	18 - 25

	No.	%
Nature of lab:		
Hospital lab	6	40
Commercial lab	6	40
Charitable lab	3	20
Test performed:		
Manual	0	0
Automated	15	100
Alternate power supply:		
UPS	2	13.33
Generator	5	33.33
Both	8	53.33
Type of CBC bottles:		
Commercially prepared	8	53.33
Prepared in lab	5	33.33
Both	2	13.33
Domestic refrigerator:		
Yes	15	100
No	0	0
Control available:		
Yes	15	100
No	0	0
Control use:		
Daily	13	86.66
When problem arises	2	13.33
Quantity of blood in CBC tubes:		
Same in all tubes	10	66.66
Variable	5	33.33
Co-operation of lab staff:		
Freely allowed	12	80
Hesitant	3	20
Not allowed	0	0

## DISCUSSION

In this study the effects of temperature regulation of CBC samples was evaluated. Our findings showed that some CBC parameters can be changed with the variation in temperature but Gulati has reported that platelets count did not change up to 4 days incubation at room temperature (Tarar, 2002) Vogelaeer et al. that evaluated 304 blood samples of 17-70 years old individuals have reported that incubation blood samples in room temperature for 48 hours did not change the number of RBC, WBC and platelets (Uchida, K., 2000) According to the study of Hirase, the blood cells were stable after one week of incubation (Gulati, 2002), but in Wood's survey the incubation of samples for 24 hours resulted in the increase of WBC counts (Sarwar, 2006) In Zhang study the cause of platelets increasing explained as increase in whole blood viscosity (Tarar, 2002) Uchida in 2000, Shortland in 1997 and Qi in 2001 have reported that raising the temperature leads to changes in platelet's morphology and movement. (Hirase, Y., 1992; Qi, R.,). It has also been reported in a comprehensive study by Ho et al. that different temperature and time

of incubation can affect in platelets counts and hemoglobin concentrations (Shortland, A. P.,1997)

## CONCLUSION

The results of this study showed that delay in doing the CBC test can leads to changes in some parameters, therefore the blood samples should not be leaved in the laboratory and the test should be done on blood samples as soon as possible.

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