

ABNORMALITIES IN BLOOD PARAMETERS OF PATIENTS IN FIVE DIFFERENT AREAS OF KARACHI

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Abstract

More than 1300 blood samples of patients from five different populations were collected, and a complete blood count (CBC) was performed. Out of twenty, fourteen parameters show abnormal result, indicating various blood related diseases. Distribution of blood parameters in different areas show a similar trend, while the values of individual particles greatly vary from site to site, and with in the site. A large number of people showed lower than normal values of blood parameter in each area. On the basis of the parameter values, sites may or may not be significantly differ with each other. Metroville site was significantly different from all other sites on the basis of RBC, RDW, WBC and MPV values. It is suggested that on one side poverty, poor hygiene, and pollution are responsible for the various blood related deficiencies/diseases in the population of Karachi, while on the other side consumption of unbalanced junk food and pollution is responsible.

Introduction

Karachi is the fifth largest city of the world and the largest city of Pakistan. The city holds over 20 million in population. Due to the high population and pollution many health problems are associated in vast numbers (Rao *et al.*, 2011a). This city exhibit different types of communities which are different from each other on the basis of income, life style, diet, knowledge about basics of health, and also poverty level (Rao *et al.*, 2009; 2011).

Blood plays a vital role in maintaining health. It not only provides O₂ to each and every cell but also collect waste from the body. It is composed of various blood cells responsible for different functions. If the blood cell distribution is within the physiological range, a person is considered healthy. However any increase or decrease than normal is considered an unhealthy or abnormal condition indicating some sort of health problem (Kueviakoe *et al.*, 2011). If a person has an infection, bruising, bleeding, inflammation, weakness or fatigue, a complete blood count (CBC) is recommended to help diagnose the problem and cause. Increase and decrease cell count are the results of various reasons in the body. Some of them may require additional tests or treatment, while some of them may resolve on their own. Change in blood cells populations may be due to same diseases, infection, or deficiencies of vitamins, minerals or iron (Al-Zain, 2009). Normally, complete blood count (CBC) is the measure of the concentration of red blood cell, white blood cells and platelets in the blood. An extensive sampling was conducted in five different areas of Karachi. Selection of site was based on people living in different levels of hygiene, population density, pollution, traffic density, income and life style. It is anticipated that living conditions may reflect some trends or blood parameter of the sick people living under different conditions may reflect or show the signs of various intensities of abnormalities in CBC.

Overall, health conditions of any person may be evaluated by a complete blood count (CBC), therefore, this primary study deals with the blood samples of outdoor patients regardless of any specific disease, in five different areas of Karachi to determine the complete blood picture of these patients.

Materials and Methods

This study was a preliminary work, based on the blood samples of five different localities of Karachi. These areas were identified on the basis of overall hygienic condition of the area, poverty level, life style of the people, density of population, pollution, industries, and traffic densities (Rao *et al.*, 2009; 2011b). The samples were collected regardless of gender and age group. In each location a phlebotomist was consulted to take the blood samples from patient suffering from different diseases. Over 250 blood samples were collected from each area in a vacuumated and EDTA.K₃ coated tubes, which helps in de clotting the blood. These samples were frequently packed in an ice box and brought to the laboratory for blood analysis. The automatic blood biochemistry analyzer of Medonic M-series Model No. 10548 made by Medonic Corporation Germany was used and the computerized report of the blood analysis was obtained. This analyzer counted the blood samples

in 20 parameters which clearly showed three main components of blood (Rappaport *et al.*, 1988; Gulati and Hyun, 1994) *i.e.* red blood cells, white blood cells, and platelet.

Duncan's multiple range test was carried out to see any significant difference among sites in any particular blood particle (Duncan, 1955; Gomez and Gomez, 1984).

Results

The results showed that out of twenty, fourteen blood parameters were found above or below the normal range in five different areas of Karachi. Therefore distribution of only fourteen blood parameters in different area is shown in Fig. 1 (A to E).

Malir area: Is considered a lower class population where the overall hygienic situation is poor. Blood parameters in this area showed a negative trend (lower number than normal). Abnormal result in decreasing order of lower limits than normal were HCT, MPV, HGB, RDW, PLT, MCV, RBC, WBC, MCH, GRAN and LYM. Only in twenty three people WBC were above the normal values. This area indicated lower values of PLT and MPV in a large number of patients. RDW parameters were also lower than normal in contrast to other area.

Korangi area: It is a thickly populated industrial area. Besides industrial and domestic pollutions this area holds a large number of automobiles. The population is lower middle class. In contrast to Malir, here RDW are at the higher limits of normal. Though both area show similar negative value of WBC, higher than normal value are considerably lower than the Malir area. Abnormal blood particles (lower limit than normal) with decreasing values are HCT, HGB, MPV, RBC, PLT, WBC, MCV, MCH and MCHC.

Metroville area: The complete blood count (CBC) trend is the same as Korangi area. However this area indicates the highest (91) number of possible allergy patient with higher than normal value of RDW and WBC. Distribution of WBC (lower than normal) is the same as the previous sites. Lower than normal values of different blood particles in decreasing order were HCT, HGB, MPV, RBC, MCV, PLT, MCH, WBC and MCHC. This area is considered as lower middle class, who have a lower daily income, and less education. Pollution of industrial and residential waste makes the area favorable for development of diseases and infections.

Maymar area: It is an open, less populated, less polluted area with a middle to upper middle class population. Overall, the hygienic situation is also better than the other areas. Although the distribution of blood parameters showed the same trend as the above mentioned two sites. The highest number of individuals showed lower than normal value of HCT and HGB. WBC values were similar to the Korangi area. MPV values were lowest in this area and blood parameters lower than normal values in decreasing orders were HCT, HGB, MPV, RBC, MCV, PLT, WBC, MCH and GRAN.

Lines area: In this area, 115 patients indicated lower than normal limit of HCT and other blood parameters, except MPV. The distribution trend of parameters is the same as the other areas except their numerical values. The population of this area are lower middle class. In addition, this locality is situated in the center of the city; therefore large numbers of different types of vehicles emit their exhaust in the atmospheric air of the area.

Values of patients with abnormal blood counts were subjected to Duncan's multiple range test to see if there were any significant differences among the populations of the five sites. The summary of analysis was presented in Table 1.

RBC counts in each area are significantly different from the other area. Highest numbers of patients (83) with abnormal RBC counts were recorded from Metroville while this number was lowest (47) for the Lines area. Associated cells of RBC may or may not be significantly different among the five sites. A significantly high numbers of patients (69) with abnormal WBC were also found in Metroville area and similarly to previous blood parameters, a significantly low numbers of patients (33) with WBC were also recorded from Lines area. Malir and Maymar patients did not show any significant difference in WBC distribution, while both areas are significantly different from the other three areas.

A significantly high numbers of patients with abnormal PLT (72) were recorded in Lines area while the Malir population (98) was dominated by abnormal MPV (Table. 1). A significantly low numbers of patients (40) with abnormal PLT were found in the Metroville population, while a significantly low numbers of patients (77) with abnormal MPV were recorded from Korangi area.

Discussion

It is shown that in each area, a large number of patients produced lower than normal range of blood cells and its related particles *i.e.* RBC (red blood cells), MCV (mean cell volume), HCT (hematocrit), HGB (hemoglobin), MCH (mean cell hemoglobin) and MCHC (mean cell hemoglobin concentration). However RDW (red cell distribution width), were in a higher than normal range except in the Malir population. Platelet (PLT) and mean platelet volume (MPV) also showed a lower than normal range in a higher number of patients in each area, while in Lines area more patients had a higher than normal range of PLT. The white blood cells and their associated particles were seen in less number. Only white blood cells (WBC) showed the abnormality in higher number of patients.

The present study shows that regardless of the hygienic situation of the area, life style of the people, income level, poverty level, and education level of the area, red blood cells, white blood cells, and platelet parameters are distributed in a lower than normal range in most of the patient of all five areas.

In each area a large number of patients showed a decreased hematocrit (HCT) indicating anemia which may be due to iron, vitamin, or mineral deficiencies. MCV and MCH should always be viewed together therefore the values suggest a possible copper, vitamin C, B₆, or iron deficiency. In addition it could also be an indicator of toxic effects of lead and other elements. Therefore this may be related to the thousands of motor vehicles, extremely poor system of vehicle warrant of fitness, open garbage places, without proper waste collection, lack of landfill site, and dumping of domestic and industrial waste in the city (Rao *et al.*, 2009).

Large numbers of people from all communities also showed a lower than normal counts of hemoglobin (HGB). Due to the wide range of hemoglobin level in the human body, an abnormal level may not necessarily be a problem (Tefferi *et al.*, 2005). Therefore it should be evaluated with HCT, RBC and MCV to determine types of anemia, chronic diseases, bone marrow insufficiency etc. It is reported that people with normal to lower hemoglobin and hematocrit levels are more active and healthy than patients with low or high normal level, however more investigations are required in Pakistani situations.

Red cell volume distribution width (RDW) is a numerical measure of anisocytosis. It is reported that only raised RDW are of significance and subnormal values do not occur. This is a more sensitive measure of abnormality in microcytic, rather than macrocytic disorders, and is only of help if the hemoglobin is low. Except Korangi, all areas indicated this situation. It is anticipated that a large number of patients in Karachi are suffering with either iron deficiency or megaloblastic anemia. In contrast to other areas, Metroville patients seems to be more sensitive to chronic inflammatory conditions, asthma, allergy, parasitic infestation *etc.* due to an increase in eosinophils (WBC).

Reduced platelet counts (PLT and MPV) are also common in patients of all communities. People who have a lower than normal platelet count, tend to bleed easily after brushing their teeth or acquiring small cuts. Metroville and Lines area indicated both higher and lower than normal platelets, while people of the other three areas had lower than normal platelets in CBC. These people indicated decreased production, congenital, marrow depression, marrow infiltration, or megaloblastic anemia (Yilmaz *et al.*, 2008).

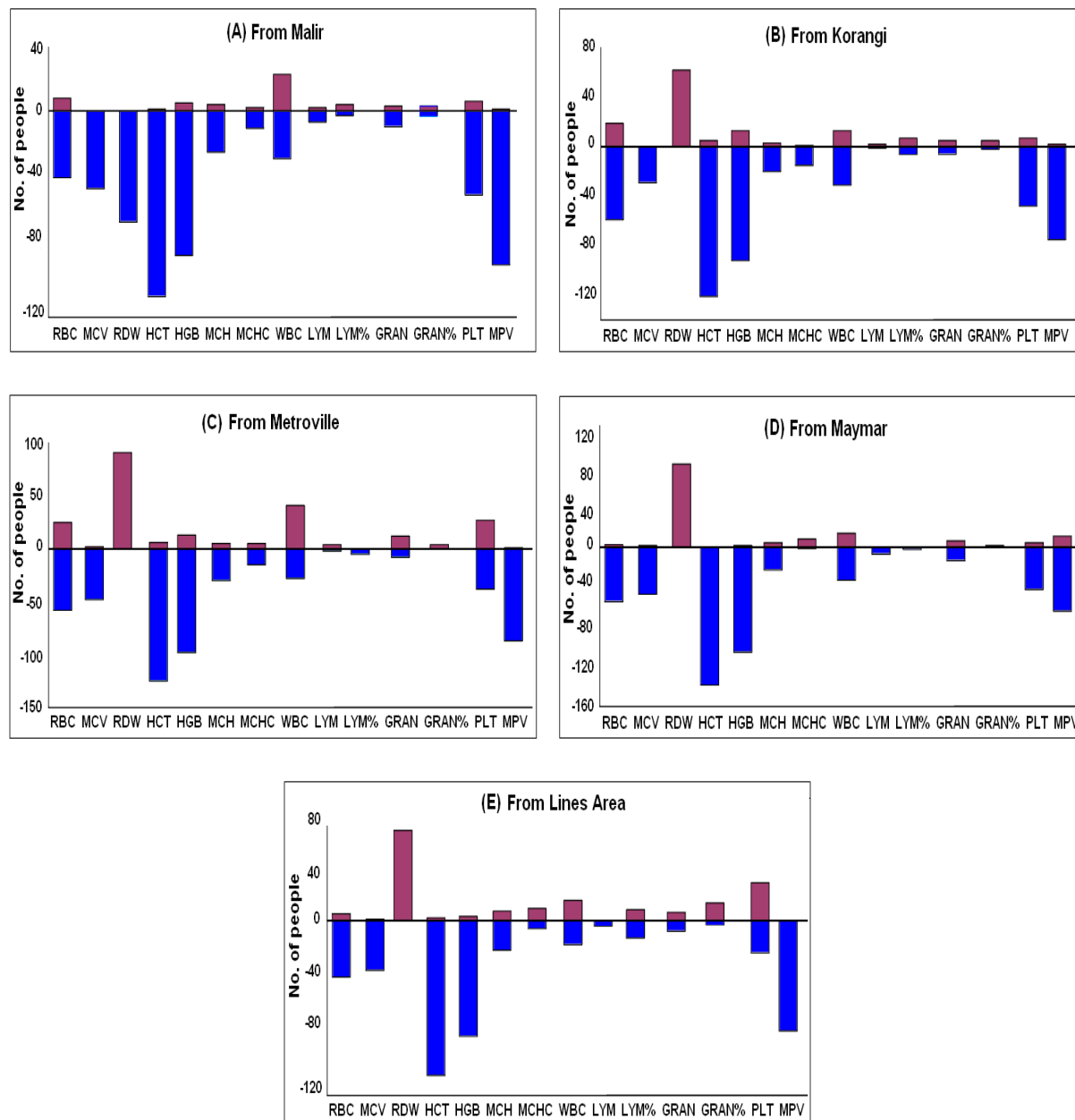
A significantly high number of patients with abnormal RBC, RDW, some related particle, WBC, and MPV from Metroville site may be associated with low income, poor hygiene, congested population, industries and high traffic. This area is similar to Korangi, but in Korangi the winter breeze moving from inside towards the coast and summer breeze moving from coast to the inside, reduce air pollution. Therefore, Metroville atmosphere is considered more polluted and harmful for the general health of the people.

Lines area has no industry but due to congested population, low income and the highest intensity of traffic, is also considered highly polluted, showed a high number of patients with abnormal PLT. Overall hygienic situation of Malir is extremely poor therefore these low income patients show significantly high values of MPV.

It is suggested that people of low income are unable to afford high nutritional food or obtain a balanced diet, while the higher income population mostly consume overcooked, fried, higher fat contained junk food etc. Therefore the lack of a balanced diet in these patients results in an abnormal blood count in a large number regardless of life style or income. CBC of healthy people of Defence (Ahmed *et al.*, 2012) are also showed the same trends gives additional support to the opinion. In addition it is anticipated that the poor hygienic situation of most of the areas, vehicle emission, condense residential areas, impurities in food, contaminated food, open domestic and industrial waste dumping sites, absence of land fill sites, open garbage burning, unprofessional experts in Environmental Protection Agency and poor control of EPA is responsible for the overall unhealthy environment of the city and poor health conditions (abnormal blood count) of the populations of Karachi.

A complete blood count (CBC) is one of the most common laboratory tests recommended by physicians. According to Bain (1996) up to 5% of the general people without disease may also show values of above or lower than normal blood count. Therefore values of abnormal blood count should be treated according to the individual base line values. Tefferi *et al.*, (2005) stated that women have a lower RBC count and a higher PLT count as compared to men in normal conditions. Similarly Africans show significantly lower HGB, WBC, neutrophils and platelets than Caucasians. Therefore during CBC interpretation race and sex should also be

considered. Kho *et al.*, (2007) reported that certain values of CBC *i.e.* burr cells, NRBC's and absolute lymphocytosis help physicians to assess mortality risk. Considering age, sex and other variables of CBC they were also able to predict a 3-fold increase in 30 days mortality. It is suggested that in the future during CBC studies, race, age group, and gender should also be included. However the present preliminary investigations only showed present status of CBC abnormalities and possible risk in patient from five different areas of Karachi.



■ Patient with above than normal range, ■ Patient with lower than normal range

Fig.1. Number of people in above and lower the normal values of blood particles in five different areas of Karachi.

Note: 0= normal range, RBC= red blood cells, MCV= mean cell volume, RDW= red cell distribution width, HCT= hematocrit, HGB= heamoglobin, MCH= mean cell heamoglobin, MCHC= mean cell heamoglobin concentration, WBC= white blood cells, LYM= lymphocyte, LYM%= lymphocyte percentage, GRAN= granulocyte, GRAN%= granulocyte Percentage, PLT= platelet, MPV= mean platelet volume.

**Table 1. Difference in patients from five areas of Karachi
(Duncan's Multiple Range Test)**

Blood Particle	RBC	MCV	RDW	HCT	HGB	MCH	MCHC	WBC	LYM	LYM %	GRAN	GRAN %	PLT	MPV
Malir	50 d	49 a	89 a	118 d	96 c	30 b	13 bc	53 b	9 a	7 c	13 b	6 bc	59 b	98 a
Korangi	68 b	29 c	62 c	126 c	105 b	23 c	16 ab	44 c	3 c	13 b	11 b	7 b	55 bc	77 d
Metroville	83 a	50 a	91 a	131 b	111 a	35 a	20 a	69 a	6 abc	5 cd	20 a	4 bc	40 d	88 b
Maymar	61 c	52 a	70 b	147 a	114 a	29 b	10 c	50 b	7 ab	2 d	21 a	2 c	50 c	80 cd
Lines area	47 e	38 b	67 b	117 d	89 d	29 b	15 b	33 d	4 bc	21 a	14 b	16 a	72 a	82 c
LSD _{0.05}	2.57	4.60	3.35	4.22	5.20	4.06	4.22	4.60	2.93	3.25	4.30	3.81	6.14	4.60

Figures followed by the similar letters in a column shows are not significantly different from each other.

Acknowledgement

Authors acknowledge the Higher Education Commission of Pakistan for providing funding under the Project No. 20- 549/R & D/05 and various health professionals providing facilities of their clinics in different areas of Karachi.

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