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Study of Anemia and its co-relation with Hematological parameters and aging in Peshawar, Pakistan

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Abstract
The present study was conducted in Peshawar, Pakistan in September 2016 on anemic patients. Total 100 samples were collected from the age of 18 months to 80 years in EDTA tubes and complete blood count was done on Sysmex kx-21. Results indicated that total of 48% were found anemic, 25(52%) females and 23(47%) males showed positive results of having HB level lower than normal range. Results showed that females are more anemic as compare to male. Highest rate of anemia is observed in patients of age group of 21-40 i-e (31.25%). The hematological parameters are different due to age and the body required rotten diet containing iron supplements. The prevalence of anemia increases with passage of time and in different age groups. Recent studies showed that anemia is a wide spread problem and it requires special attention of public/private sector through awareness, health education and dietary guidance.

Keywords: Anemia, Iron deficiencies, Hematological parameters.

1. Introduction
Anemia can be defined as a decline in red cell mass from the total volume below normal limits. Anemia diminishes oxygen-carrying capability of red blood cells eventually causing tissue hypoxia [1]. Anemia is a multi-factorial health problem in which the risk factors could be nutritional (iron, folate, and vitamin B12 deficiencies). Anemia is worldwide health problem and in developing countries about two third of pregnant women population are affected by this disease [2]. Apart from pregnant women, children (both preschool and school-age) are the most affected group by ID because of the accelerated growth and general cognitive development [3,4]. The World Health Organization has estimated that more than 2 billion people worldwide are suffering from anemia. Among all, 50 % of anemic patients were affiliated to iron deficiency [5]. Iron deficiency type of anemia is most prevalent due to nutritional deficiency all over the world [6]. Hematological studies are useful in the diagnosis of many diseases as well as investigation of the extent of damage to blood [7]. Hematological studies are of ecological and physiological interest in helping to understand the relationship of blood characteristics to the environment [8]. Anemia is a global public health problem affecting both developing and developed countries with major consequences on human health as well as on socio-economic development. Although anemia can occur at any point throughout life span but prevalence is dominant in pregnant women and young children. Anemia directly influence on patient's mental development and learning capacity. In infants it may cause a permanent loss of IQ later in life, shortened attention span, irritability, fatigue, concentration difficulty, lethargy, weakness and increased susceptibility to infection. Consequently, anemic children tend to do poorly on vocabulary, reading, and other tests [9]. The hemoglobin concentration, red blood cell count and hematocrit value begins to decrease in men in their sixth decade and in women in their seventh decade but the changes are more prominent with advancing age in men [10]. The iron deficiency in women occurs most often during the reproductive years, whereas in men the incidence is relatively high in adolescent and low during young adulthood; it increases thereafter with advancing age. The aim of this study is to evaluate the anemic patient on the basis of age and gender wise study of their blood, the hematological parameters of the subjects involved and the prevalence of anemia through the clinical examination.

2. Materials and Methods

This study was design at the Department of Biotechnology Bacha Khan University Charsadda. Selected area of our study was Peshawar, Pakistan and the study was conducted in September, 2016. Total of 100 patients blood samples were collected. The blood samples were collected by using aseptic technique from the different anemia patients that are came to the Khyber Teaching Hospital (KTH) Peshawar. For the collection of blood samples, collection site was cleaned with antiseptic liquid to kill germs. Blood was drawn from antecubital vein by means of sterilized syringes. About 1 - 3 ml blood from each individual was collected and poured into purple top EDTA (ethylene diamine tetra acetic acid) tube.

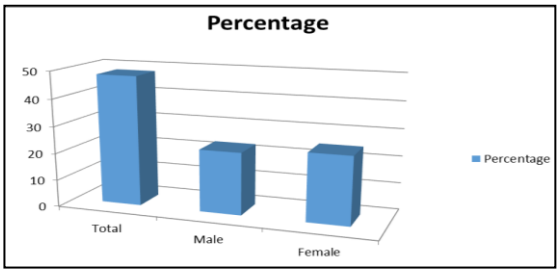
The population study area comprised of both genders contains males and females between the ages of 18 months – 80 years from urban area of Peshawar. The equipment used for analysis was an automatic hematological analyzer model Sysmex Kx-21. The calculated parameters includes hemoglobin (Hb), hematocrit (Hct), mean corpuscular volume (MCV), mean corpuscular Hemoglobin (MCH), Mean corpuscular hemoglobin concentration (MCHC), red blood cell count (RBC), white blood cell count (WBC), and platelet count [11-13]. Laboratory work was performed at Biochemistry section, department of pathology Khyber teaching hospital Peshawar, KPK.

3. Results

Out of total 100 samples, 48 were tested as positive of anemia including 25 female and 23 male patients accounted for 52%, 48% respectively. Table 1 and Graph 1 illustrates the complete data below.

Table 1: Percentage of gender wise distribution

Gender	Number of isolates	Percentage (%)
Male	23	48%
Female	25	52%
Total	48	100



Graph 1: Percentage of gender wise distribution

Prevalence of anemia in indoor patients in district Peshawar was 54.16% in female and 45.83% in males have low Hb value than normal and were anemic. The percentage was more in female than males.

Severity of anemic condition was determined among the patients who were tested positive. Out of 48 anemic patients, 6 patients both male and female showed mild anemic conditions, 15 patients were constituted as moderate anemic patients and 27 of them were having severe condition of anemia (Table 2 and 3). This data shows that although prevalence of anemia was high in females with respect to males but the percentage of severity was determined high in males.

Table 2: Mild, Moderate and Severe Anemia in Male and Female

	Mild	Moderate	Severe
Male	2 (4.16%)	4 (8.33%)	16 (33.33%)
Female	4 (8.33%)	11 (22.91%)	11 (22.91%)
Total	6 (12.49%)	15 (31.24%)	27 (56.24%)

Table 3: Severity of Anemia

Severity of Anemia	Numbers of subjects	Percentage
Mild	6	12.5%
Moderate	15	31.25%
Severe	27	56.25%
Total	48	100%

Above results indicated that there were fewer patients who exhibited mild or moderate anemic conditions compared to the severe one. Now in order to find out at which stage of life anemia is highly prevalent, the patients were divided into multiple age groups to determine age based analysis of their blood. The highest rate of anemia presence was observed in the patients of age 21-40 (Table 4). These results suggested that Anemia is most common in adult population.

Table 4: Presence of Anemia on the Basis of Age

Age	Number of Isolates
1-20	14 (29%)
21-40	15 (31%)
41-60	14 (29%)
60 and onwards	5 (10%)
Total	48 (100%)

Different hematological parameters of blood of males and females were also studied including Hematocrit (HCT), red blood cell count (RBC), Mean Corpuscular Hemoglobin (MCH), hemoglobin (HB), white blood cell count (WBC), Mean Corpuscular Hemoglobin Concentration (MCHC), Mean Corpuscular Volume (MCV) and Platelet Count (P/C). These blood parameters are changed due to age and the body required rotten diet that contains iron supplements. Use of iron containing supplements in daily use can help avoiding anemia. The hematological parameters are dependent on the age and the proper nutrition. The Mean, Standard and Average deviation of different parameters of blood are shown in Table (5 and 6).

Table 5: Hematological Parameters of Male Blood

	Age	TLC	RBC	HB	HCT	MCV	MCH	MCHC	P/C
Average deviation	35.33	92902	4.41	10.67	37.38	81.33	25.96	31.01	262992
Maximum deviation	72	24810	6.67	17.2	55.2	114.1	37.2	36.1	761000
Standard deviation	18.48	3690.4	1.31	3.83	11.25	11.73	4.45	3.09	151639.7

Table 6: Hematological Parameters of Female Blood

	Age	TLC	RBC	HB	HCT	MCV	MCH	MCHC	P/C
Average deviation	35.92	8444	4.5324	10.49	36.13	81.396	25.95	31.59	255694.2
Maximum deviation	80	15770	5.93	15.2	47.9	97.8	32.2	39.7	587000
Standard deviation	18.23	3055.9	0.8205	2.797	6.62	7.69	2.97	2.65	107338.5

4. Discussion

Aging is heterogeneous phenomena and varies widely in different individuals. The aim of present study was to know anemia and its correlation with hematological parameters and aging. In present study, males and females of different age groups were involved shown significant changes in different hematological parameters. A routine clinical data was gathered from a large number of patients and it was established that anemia was present in a majority of adults and young children.Previous studies indicated that the iron supplements also raise the RBCs values to a significant level. Kuizon *et al.*, showing positive role of iron supplements to improve the hematological status [14]. It has been determined that aging has profound effect on blood cells. The amount of fat in a marrow increases with age suggesting less cell-producing marrow. This decrease generally does not cause problems, it may when the body experiences an increased demand for blood cell, the marrow of an older person may be less able to meet those increased demands. Patients may present anemia having low white blood cell or platelet counts, singly or in combination. The presence of low blood counts could be mild, moderate or even severe. Bain *et al.*, First showed that platelet count varied according to age, gender and ethnicity [15]. A similar study conducted by Padaila *et al.*, showed similar results [16]. Their study contains a sample size of 103 in the age group of 20 to 89 years. Out of these, 53 were males and 50 were females. Whereas present study contains a simple size of 100 patients in the age groups of 18 months to 87 years. Their result showed that most of the hematological parameters decrease significantly in males after fifth decades. In females, these changes were not significant in most of the hematological parameters. Poor nutrition resulting in vitamin B12 and folic acid deficiency in old age might be the cause of early hematological changes and early aging. Iron containing food supplements are very necessary in daily use. Average daily diet should contain 13-15 mg of iron for females of the age of 12-18 years, though only 10% of this is observed. For adult males it require 10 mg and for adult females 12 mg (Table 7).

Table 7: Iron food supplements necessary for daily use

Serial no	Food item	Iron contents per 100 gram
1	Wheat	1.5mg
2	Rice	0.6mg
3	Maize	1.5mg
4	Soya bean (green peas)	10.4mg
5	Green leafy vegetables	Unabsorbed
6	Potatoes	0.7mg
7	Spinach	3.2mg
8	Nuts	10-14mg
9	Apple	0.3mg
10	Banana	0.5mg
11	Graps	1.5mg
12	Guava	0.27mg
13	Mango	1.3mg
14	Orange	0.32mg
15	Milk	0.7-3mg
16	Egg	1.0mg
17	Fish	1.9mg
18	Chicken	6mg
19	Beef	11.4mg
20	Black Gram (urd)	3.8mg

Qureshi *et al*., study are near similar to present one, their findings demonstrate a higher prevalence of anemia in women than in men considering all the age groups [11]. In present study 50 were male and 50 were female. Among these hundred samples, 48 showed positive results of having anemia including 26 (54.16%) female and 22 (45.83%) male. Their HB level was lower than normal percentage in females compared to males. In present study mild anemia in both male and female patient is 12 (12.5%) and moderate anemia is 15 (31.25%) and severe anemia is 27 (56.25%). Severe anemia percentage was profound as compare to mild and moderate anemia.

The high rate of anemia occurs in both male and female in the age from 21-40 i-e 15 (31.25%) but less anemic from above 60 i-e 5 (10.41%). Present results showed that when the age increases, hematological blood parameters also increase. Hematological parameters depend on the age of a person and the daily diet that contain the iron content.

Other studies has been conducted previously regarding anemia and its correlation with aging and poor diet. *Pourghassem et al.*, studied iron deficiency in diet of 652 high school students and the prevalence of anemia among them [17]. Somewhat similar studies were reported by *Balducci et al.*, *Choi et al.* in order to determine whether the raised prevalence of anemia in older patients were due to their iron deficient diet or simply the age factor was responsible [18-20]. Present study is one of the first anemic studies that has been carried out in Peshawar region. To our knowledge there is not a single study reported in Peshawar region evaluating the raised prevalence in correlation with aging and dietary factors.

5. Conclusion

The prevalence of anemia increases with passage of time and in different age groups, the prevalence of various types of anemia is different, which is because of different etiology and severity in these age groups. This study showed that anemia is a wide spread problem. Hematological parameters guiding the type of anemia differ in various age groups involved which reflect the varying etiologies behind this. However, anemia is not a condition that should only be associated with the aging process. Our finding showed that about half of the patients were anemic and as compare to males, females were more affected. Low cost iron and folic acid supplement can further reduce the anemia.

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7. Declaration of interest

None of the authors of this paper had any personal or financial conflicts of interest.

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