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TO DETERMINE THE IRON PROFILE AND CLINICAL PATTERNS OF ANEMIA AMONG MEDICAL COLLEGE STUDENTS

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Abstract:

Objective: *Anemia is defined as reduced hemoglobin, hematocrit (Hct) or red blood cell counts (RBC) below baseline levels. Iron deficiency (ID) is most common type of nutritional anemia prevalent Worldwide. Previous estimates show 2.15 billion people are suffering from Iron deficiency anemia (IDA) and commonly affected are the children and women particularly in the developing countries. To determine the iron profile and clinical patterns of anemia in young medical college students,*

Study Design: *This was an observational study*

Place and Duration of Study: *This study was conducted at the Department of Pathology, Pakistan Institute of Medical Sciences Islamabad, from January 2020 to September 2020.*

Materials and Methods: *A sample of 167 medical students was selected by non – probability convenient sampling. Volunteers were asked for blood sampling. 5 ml blood was drawn in disposable syringe. 2 ml was taken in EDTA tubes for the hematological indices and 3 ml was centrifuged to get sera for the estimation of serum iron, ferritin, TIBC and TSAT. Data was analyzed on SPSS 21.0 (USA) at 95% CI (P≤ 0.05).*

Results: *Of 167 students; 99 (59.2%) were male and 68 (40.7%) were female. Age of male was 21.43±1.83 and female was 21.71±2.17 years (P=0.39). Normal and low serum Iron levels were noted in 60 (66.6%) vs. 31 (45.5%) and 39 (39.3%) vs. 37 (54.5%) of male and female respectively. Normocytic, microcytic and macrocytic anemia were noted in 63 (63.6%), 25 (25.2%) and 11 (11.1%) of male compared to 29 (42.64%), 31 (45.5%) and 8 (11.7%) of female respectively.*

Conclusion: *The present study reports high frequency of low iron profile and anemia in young medical students.*

Key Words: *Anemia, Iron, Ferritin, Hematological indices.*

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INTRODUCTION:

Anemia is defined as reduced hemoglobin, hematocrit (Hct) or red blood cell counts (RBC) below baseline levels. Iron deficiency (ID) is most common type of nutritional anemia prevalent Worldwide. Previous estimates show 2.15 billion people are suffering from Iron deficiency anemia (IDA) and commonly affected are the children and women particularly in the developing countries. [1,2] World Health Organization (WHO) defined cut off values for anemia in under 5 five children and pregnant women as Hb <11 g/dl, for non – pregnant women <12 g/dl and for men <13 g/dl. Highest prevalence of IDA is observed in South Asia and Africa showing 40% IDA in all age groups. [3]

Dietary deficiency and worm infestations are common cause of IDA in developing countries. Other causes are; vegans, malabsorption, chronic blood loss, etc. [4,5] Hematological indices of IDA include low Hb, Hematocrit (Hct), red blood cell (RBC) counts, mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), and mean corpuscular hemoglobin concentration (MCHC). [5] Early stages of ID may be evaluated by serum ferritin, serum iron levels, total iron binding capacity (TIBC) and Transferrin saturation (TSAT). Commonest screening methods are the Hb, Hct and RBC counts, but these may be normal in earlier stages of ID. [6] However, these hematological indices have their limitations especially in earlier stages of ID. The Hb, Hct MCV, MCH and MCHC are slow and insensitive as early indicators of IDA. However, the serum ferritin, TIBC and TSAT are more sensitive. [7] In Pakistan, the iron deficiency is prevalent as reported. [8,9] Although the serum iron and ferritin are expensive but it is reasonable to assume that developing countries population with high anemia prevalence is also likely to have a high prevalence of iron deficiency. [9] In this context, the iron profile needs further research. Keeping this scenario of prevalent ID and IDA; the present research was conducted to analyze the clinical patterns of anemia and iron profile among the medical students of Indus Medical College. The present research analyzed the serum iron, serum ferritin, total iron binding capacity (TIBC) and Transferrin saturation (TSAT) levels.

MATERIALS AND METHODS:

An observational study was conducted at the Department of Pathology, Pakistan Institute of Medical Sciences Islamabad, from January 2020 to September 2020. A sample of 167 medical students was selected by non – probability convenient sampling. Sample comprised of 99 male and 68 female medical students. Participants were selected by non- probability (convenient) sampling inclusion and exclusion criteria. Medical students of 1st – 3rd years, age 18 – 25 years and both male and female health looking were inclusion criteria. Medical student with diabetes mellitus, chronic diarrhea, pulmonary tuberculosis, chronic liver disease, taking gutkha, manipuri, betel nuts, pan, etc were excluded. A student taking multivitamin and minerals pills was exclusion criteria. Participants were negotiated of the purpose of study, merits and demerits, financial loss and conflict of interest. Participants were informed that the laboratory charges/expenses will be paid by the researcher. Volunteers were asked of the verbal consent and blood sampling. They were informed that the registration to study protocol will cause no body harm or financial constraints. The participants were interviewed of the purpose of research. Participants were informed of full compliance of research protocol voluntarily. Biodata of students was taken, examined physically to exclude major systemic disease, and blood samples were collected. Prominent vein in ante – cubital fossa was chosen for venesection, drawing 5 ml blood after area was sterilized by alcohol swab. Of 5 ml blood; 2 ml was taken in EDTA tubes for the hematological indices and 3 ml was centrifuged to get sera for the estimation of serum iron, ferritin, TIBC and TSAT. Sera were obtained by centrifugation at 3000 x rpm for 15 minutes. Hematological indices included red blood cell counts and indices; hemoglobin, hematocrit, mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH) and mean corpuscular hemoglobin concentration (MCHC). Serum iron, ferritin, total iron binding capacity (TIBC), and Transferrin saturation (TSAT) were detected from the sera. Ferritin was measured by Immulite – assay kit (Chemiluminnescent system, UK). Cobas e 411 Roche Diagnosis GmbH, Mannheim, Germany analyzer was used for the biochemical testing. Confidentiality was maintained and variables were entered in a proforma. Statistical comparisons of continuous variables was performed by the Student`s t-test (Independent sample t – test) and categorical variables by Chi – square test (Cross tabulation). Data was analyzed at 95% Confidence interval ($P \leq 0.05$).

RESULTS:

Of 167 students; 99 (59.2%) were male and 68 (40.7%) were female. The age of male was 21.43±1.83 and female was 21.71±2.17 years (P=0.39). Hemoglobin, Hct (%), RBC, MCV, MCH and MCHC are shown in table 1. The difference between male and female was statistically significant

(P<0.05). Serum Fe++ in male and female was 129.59±15.82 µg/dl and 107.54±22.55 µg/dl (P=0.0001). Serum Ferritin was 124.64±17.63 ng/dl in male and 103.58±19.50 ng/dl in female (P=0.0001).

Table No1: Hematological and Iron Indices of study subjects (n=167)

	Male (n=99)	Female (n=68)	P-value
Age (years)	21.43±1.83	21.71±2.17	0.39
Hemoglobin (g/dl)	13.05±2.91	12.81±2.52	0.0001
Hematocrit (%)	43.82±5.16	41.5±9.10	0.0001
RBC counts (x10^6/µL)	4.15±0.22	3.97±0.91	0.0001
MCV (fl)	76.8±11.3	71.5±12.04	0.0001
MCH (pg)	27.8±4.22	24.1±5.7	0.0001
MCHC (%)	26.3±2.14	25.7±2.29	0.0001
Serum Fe++(µg/dl)	129.59±15.82	107.54±22.55	0.0001
Serum Ferritin (ng/dl)	124.64±17.63	103.58±19.50	0.0001
Serum TIBC (µg/dl)	251.97±33.25	305.74±63.54	0.0001
TSAT (%)	35.09±7.77	28.82±8.49	0.0001

TSAT – Transferrin Saturation

Table No.2: Frequency of Iron levels (n=167)

	Male	Female	P-value
Normal levels	60 (66.6%)	31 (45.5%)	
Iron deficiency	39 (39.3%)	37 (54.5%)	
Total	99 (100%)	68 (100%)	0.0001

Table No.3: Clinical types of Anemia among students (n=167)

	Male	Female	P-value
Normocytic normochromic	63 (63.6%)	29 (42.64%)	0.0001
Microcytic hypochromic	25 (25.2%)	31 (45.5%)	0.0001
Macrocytic hyperchromic	11 (11.1%)	8 (11.7%)	
Total	99 (100%)	68 (100%)	0.0001

TIBC was elevated in female 305.7.4±63.54 µg/dl with low TSAT (%) 28.82±8.49 compared to male TIBC 251.97±33.25 µg/dl and TSAT (%) 35.09±7.77 (P=0.0001). Normal and low serum Iron levels were noted in 60 (66.6%) vs. 31 (45.5%) and 39 (39.3%) vs. 37 (54.5%) of male and female respectively (table – 2). Normocytic, microcytic and macrocytic anemia were noted in 63 (63.6%), 25 (25.2%) and 11 (11.1%) of male compared to 29 (42.64%), 31 (45.5%) and 8 (11.7%) of female respectively.

DISCUSSION:

The present observational study is the first study being reported on the clinical patterns of anemia and iron profile among medical college students of Indus Medical College, T.M. Khan, Sindh. Of 167 students; 99 (59.2%) were male and 68 (40.7%) were female. The age of male was 21.43±1.83 and female was 21.71±2.17 years (P=0.39). Our findings are keeping with previous studies. [10-12] A study from Peshawar by Khan MT et al [8] reported mean age of 21.9±2.3 years that is consistent finding. The hemoglobin, Hct (%), RBC, MCV, MCH and MCHC differed significantly between male and female students (P<0.05). These findings are in agreement with previous studies. [11-15] Khan MT et al [8] reported mean hemoglobin (P < 0.001), hematocrit (P < 0.001) and MCH (P < 0.01) were significantly different in men and women. No significant difference was observed in other hematological parameters among the two groups of students. The present study observed low Hb, Hct, RBC counts, serum Fe++, serum TIBC and serum ferritin levels in both male and female students, however, the female students show statistically low iron indices (P=0.0001). The findings are in keeping with previous studies.[8,9,10-15] Normal and low serum Iron levels were noted in 60 (66.6%) vs. 31 (45.5%) and 39 (39.3%) vs. 37 (54.5%) of male and female respectively (table – 2). The findings are supported by previous studies. [14-17] In present study, the serum Fe++ in male and female was 129.59±15.82 µg/dl and 107.54±22.55 µg/dl (P=0.0001). Serum Ferritin was 124.64±17.63 ng/dl

in male and 103.58±19.50 ng/dl in female (P=0.0001). TIBC was elevated in female 305.74±63.54 µg/dl with low TSAT (%) 28.82±8.49 compared to male TIBC 251.97±33.25 µg/dl and TSAT (%) 35.09±7.77 (P=0.0001). In developing countries, iron deficiency is an established public health problem and problem is compounded by the malnourishment. [15-18] We found low serum iron (Fe++) and ferritin and high TIBC. RBC counts, hemoglobin and hematocrit were also found low in medical students. In present study, serum iron (Fe++), ferritin and TIBC in controls and cases were noted 152.72±6.08 and 118.79±43.30 µg/dl, 394.34±136.50 and 529.87±101.0 ng/dl, & 140.80±19.99 and 130.88±28.46 µg/dl respectively (P=0.0001). Our these findings are supported by previous studies.[19-20] Because of many reasons the developing countries have high prevalence of iron deficiency (ID) and iron deficiency anemia (IDA). Serum ferritin is a source of iron that circulates in the blood plasma. Serum ferritin is a reliable marker of total iron stores. [8,9] Low serum ferritin, TSAT, Fe++ and elevated TIBC were observed in the present study. The findings are in keeping with previous studies. [19-21] Finding of low iron, ferritin, TSAT and elevated TIBC are supported by previous studies. [8,9,16,17] Normocytic, microcytic and macrocytic anemia were noted in 63 (63.6%), 25 (25.2%) and 11 (11.1%) of male compared to 29 (42.64%), 31 (45.5%) and 8 (11.7%) of female respectively. The findings are in keeping with previous studies. [20,21] We conclude that iron malabsorption and the underlying nutritional iron deficiency needs to be elucidated. The limitations of present study are; small sample size and medical students of particular life style, hence the findings are not generalizable to other settings. However, the prospective study design is strength of study that needs further elaboration. Iron and anemia among medical students needs to be addressed and demands further studies.

CONCLUSION:

The present study reports high frequency of low iron profile and iron deficiency anemia in young medical students. This needs further elaboration of iron profile studies in large sample of healthy medical college students for estimating the accurate gravity of iron and anemia related health problem.

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