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An Analytical Study Showing Association of Packed Cell Volume with the Severity of Anaemia in Adult Females

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Abstract

Aims: To correlate packed cell volume with sevierity of anaemia in adult females. *Setting and Design:* A hospital based prospective observational cross sectional 1000 consecutive cases of adult females to evaluate prevalence of spectrum of anaemia who fulfilled the inclusion criteria. Considering a confidence level of 95% and confidence interval of 3.1 the number of patients in our study to achieve statistical significance is 999. This was calculated by Survey System (http://www.surveysystem.com/sscalc.htm#one). *Statistical Analysis Used:* Considering a confidence level of 95% and confidence interval of 3.1 the number of patients in our study to achieve statistical significance is 999. This was calculated by Survey System (http://www.surveysystem.com/sscalc.htm#one). *Results:* Majority of the females (42.44%) were in the age group of 26–35 years followed by 31.9% in the age group of 18–25 years, 19.2% in the age group of 36–45 years, 4.9% in the age group of 46–55 years and 1.6% in the age group of 56–65 year. 410 (41%) females had mild anaemia while 440 (44%) and 150 (15%) females had moderate and severe anaemia. The mean packed cell volume (PCV) of females with mild anaemia was 29.13 ± 2.14% while the mean PCV of females with moderate and severe anaemia was 24.57 ± 1.86% and 20.35 ± 1.12% respectively. There was significant decrease in packed cell volume (PCV) with increase in severity of anaemia as per ANOVA test ($p < 0.05$). *Conclusion:* PCV (packed cell volume) and haemoglobin are considered as haematological indicators for classifying the severity of anaemia. Iron deficiency anemia is increasing in females, specially in reproductive age group of developing countries. The haematological parameters can aid in early recognition of type and cause of anaemia and thereby improve the outcome.

Keywords: Anaemia; Packed cell volume (PCV).

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Introduction

Anaemia is a major public health problem. Anaemia, is not a diagnosis in itself but is an objective for presence of disease. It is especially prevalent in women of reproductive age, particularly during pregnancy. Poor nutritional status during pregnancy is associated with inadequate weight gain, anemia, retarded fetal growth low birth weight, still births, preterm delivery, intrauterine growth retardation, morbidity and mortality rates.[1]

Anemia is defined as a " decrease in whole body red cell mass, a definition that precludes relative decreases in red blood cell count, haemoglobin, or haemocrit, which occur when the plasma volume". In practice, the measurement of red cell mass is not easy, and anemia is usually diagnosed based on a reduction in the hematocrit (the ratio of packed red cells to total blood volume) and the hemoglobin concentration of the blood to levels that are below the normal range.[2]

A classification of anemia is based on underlying mechanism and according to alterations in red

cell morphology. Morphologic characteristics provide etiology clues such as red cell size (normocytic, microcytic, macrocytic), degree of hemoglobinization, reflected in the color of red cells (normochromic or hypochromic), and shape. In general, microcytic hypochromic anemias are caused by disorders of hemoglobin synthesis (most often iron deficiency) while macrocytic anemias often from abnormalities that impair the maturation of erythroid precursors in the bone marrow. Normochromic, normocytic anemias have diverse etiologies; in some of these anemias, specific abnormalities of red cell shape provide an important clue about cause.

Materials and Methods

A hospital based cross sectional study was done at our tertiary care centre in central clinical laboratory of tertiary care Centre, Pune among 1000 adult females to evaluate prevalence of spectrum of anaemia.

Study Design: A hospital based prospective observational cross sectional study

Study Population: 1000 consecutive cases of adult females to evaluate prevalence of spectrum of anaemia who fulfilled the inclusion criteria.

Sample Size: 1000 patients

Considering a confidence level of 95% and confidence interval of 3.1 the number of patients in our study to achieve statistical significance is 999. This was calculated by Survey System (http://www.surveysystem.com/sscalc.htm#one). The Survey System ignores the population size when it is "large" or unknown. Population size is only likely to be a factor when you work with a relatively small and known group of people (e.g., the members of an association). Hence a sample size of 1000 was considered adequate for our study.

Criteria of Anaemias

- Adult Non Pregnant Females HB Less Than 12 gm%.
- Adult Pregnant Females HB Less Than 11 gm%

Inclusion Criteria

- Adult females Age 18 yrs or above.
- Anaemia in non pregnant and pregnant adolescent girls.

Exclusion Criteria

- Adult females who are on treatment of anaemia.
- Females less than 18 yrs.

Methodology

Institutional ethical committee (IEC) clearance was obtained before start of study. The study was carried at ccl of tertiar care centre, Pune for a period of 2.5 yrs 2017–2019. Total of 1000 cases of adult females that came for ccl were studied. The sample for test were collected in edta tube. The slides were prepared and smears made.

Results

A hospital based cross sectional study was done among 1000 adult females to evaluate prevalence of spectrum of anaemia.

Distribution of Females According to Age

Majority of the females (42.44%) were in the age group of 26–35 years followed by 31.9% in the age group of 18–25 years, 19.2% in the age group of 36–45 years, 4.9% in the age group of 46–55 years and 1.6% in the age group of 56–65 year [Table 1] [Fig. 1].

Table 1: Distribution of females according to Age

Age (years)	*N*	%
18–25 years	319	31.9%
26–35 years	424	42.4%
36–45 years	192	19.2%
46–55 years	49	4.9%
>55 years	16	1.6%
Total	1000	100%

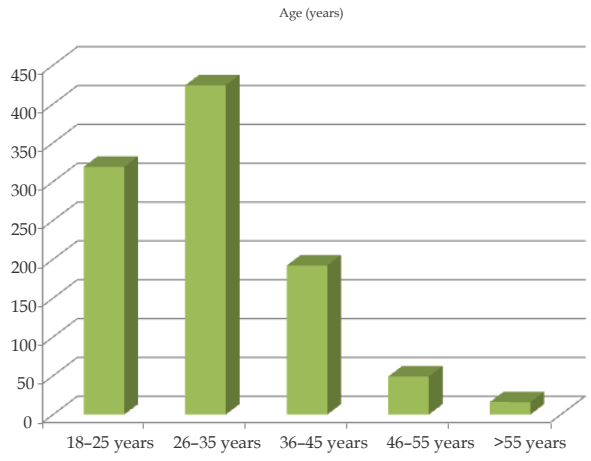

Fig. 1: Distribution of females according to age.

Distribution of Females According to Severity of Anaemia

410 (41%) females had mild anaemia while 440 (44%) and 150 (15%) females had moderate and severe anaemia [Table 2] [Fig. 2].

Table 2: Distribution of females according to severity of anaemia

Severity of Anaemia	*N*	%
Mild	410	41%
Moderate	440	44%
Severe	150	15%
Total	1000	100%

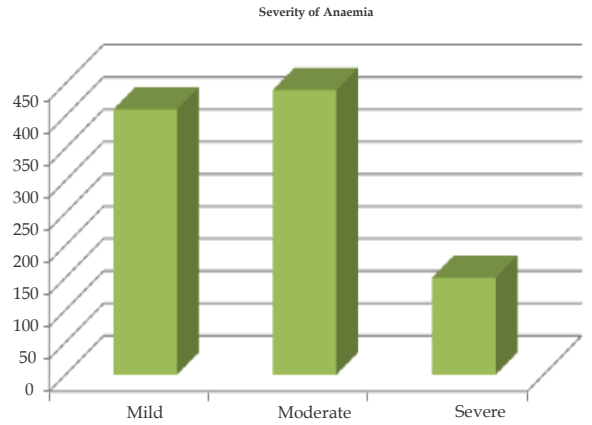

Fig. 2: Distribution of females according to Severity of Anaemia.

Association of Packed Cell Volume (PCV) and Severity of Anaemia of Females

The mean packed cell volume (PCV) of females with mild anaemia was 29.13 ± 2.14% while the mean PCV of females with moderate and severe anaemia was 24.57 ± 1.86% and 20.35 ± 1.12% respectively. There was significant decrease in packed cell volume (PCV) with increase in severity of anaemia as per ANOVA test ($p < 0.05$) [Table 3] [Fig. 3].

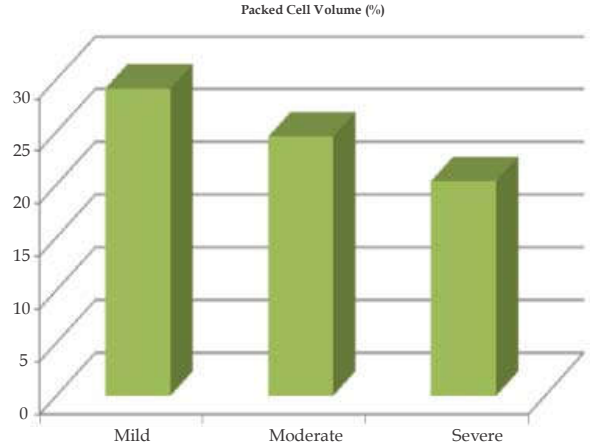

Fig. 3: Association of Packed Cell Volume (PCV) and Severity of Anaemia of females.

Table 3: Association of packed cell volume (PCV) and severity of anaemia of females

Severity of Anaemia	Packed Cell Volume (%)		*p*-Value
	Mean	SD	
Mild	29.13	2.14	
Moderate	24.57	1.86	<0.05
Severe	20.35	1.12	

Discussion

A hospital based cross sectional study was done among 1000 adult females to evaluate prevalence of spectrum of anaemia. In the present study, majority of the females (42.44%) were in the age group of 26–35 years followed by 31.9% in the age group of 18–25 years, 19.2% in the age group of 36–45 years, 4.9% in the age group of 46–55 years and 1.6% in the age group of 56–65 years. This is similar to the studies of Kumar MR et al, Sharma AK et al, Sarin J et al.[3] and Trivedi J et al.[4]

Sarin J et al.[3] study determining the prevalence of anemia among antenatal mothers with a view to develop and evaluate a planned health education programme on prevention and management of anemia in pregnancy found (68%) were in the age group of 21–25 years, followed by 21% in the age group of 26–30 years and 10% of the in the age group of below 20 years.

In our study, the mean packed cell volume (PCV) of females with mild anaemia was 29.13 ± 2.14% while the mean PCV of females with moderate and severe anaemia was 24.57 ± 1.86% and 20.35 ± 1.12% respectively. There was significant decrease in packed cell volume (PCV) with increase in severity of anaemia as per ANOVA test ($p < 0.05$). This is in concordance to the study of Sharma AK et al.[5].

Sharma AK et al.[7] evaluating the occurrence of Iron deficiency anemia among females of reproductive age group reported majority of women suffering from various grades of anaemia had reduced (77%) red blood count, packed cell volume was also lower than the normal range.

Summary

A hospital based cross sectional study was done among 1000 adult females to evaluate prevalence of spectrum of anaemia. The following observations were noted in our study:

1. Majority of the females (42.44%) were in the age group of 26–35 years followed by 31.9% in the age group of 18–25 years, 19.2% in the

age group of 36–45 years, 4.9% in the age group of 46–55 years and 1.6% in the age group of 56–65 years.

2. 410 (41%) females had mild anaemia while 440 (44%) and 150 (15%) females had moderate and severe anaemia.
3. Microcytic hypochromic anaemia was the most common type of anaemia (56.5%) followed by Normocytic normochromic anaemia (32.4%), dimorphic anaemia (6.3%) and macrocytic anaemia (4.8%).
4. The mean packed cell volume (PCV) of females with mild anaemia was 29.13 ± 2.14% while the mean PCV of females with moderate and severe anaemia was 24.57 ± 1.86% and 20.35 ± 1.12% respectively. There was significant decrease in packed cell volume (PCV) with increase in severity of anaemia as per ANOVA test ($p < 0.05$).

Conclusion

PCV (packed cell volume) and haemoglobin are considered as haematological indicators for classifying the severity of anaemia. Iron deficiency anemia is increasing in females, specially in reproductive age group of developing countries. The haematological parameters can aid in early recognition of type and cause of anaemia and thereby improve the outcome. Early detection, treatment and prevention of anemia can improve maternal as well as child outcome.

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