Prevalence of iron deficiency anaemia among microcytic anaemic premenopausal patients at tertiary care hospital, Karachi

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INTRODUCTION
One of the most common preventable nutritional factors resulting as risk factors for a high mortality rate worldwide is anaemia. Anaemia is a condition that is prevalent in both developed and developing countries which is usually present clinically, with symptoms of fatigue and investigations revealing haemoglobin below 12 g/dl according to the World health organization (WHO).
Although anaemia occurs is both male and female genders, but is highly prevalent in females that not only contributes to morbidity and mortality of mothers but also results in Preterm or Premature deliveries and low birth weight babies that is a risk factor for infant and child mortality and morbidity.1

It is evident from the literature that almost 30% of patients presenting at hospitals are anaemic but with a much higher prevalence in developing countries with the majority of patients being premenopausal females. It negatively impacts the health, life, and work during the reproductive years of the female. It also puts the life of both mother and infant at risk during pregnancy.2-9

A study showed the prevalence to be as high as 50% in premenopausal females. Whereas another study showed that 56% of pregnant females in the developing world were found to be anaemic. Furthermore, similar frequency trends were seen in the South Asian population to be 88% during pregnancy.9-14

Similarly, results of another study also showed that 50% of the pregnant women population was diagnosed with anaemia coming to tertiary care private hospital in Karachi.15,16 The sources which we are having are inadequate to report any sort of public health issue. It is important to understand factors associated with anaemia and type of anaemia most prevalent among all. This is crucial in the development of treatment and preventive strategies and policies to counter public health problems effectively.17

As being in developing country microcytic anaemia has a lot of impact on maternal mortality, especially in multigravida females. Studies have proved improvement in nutritional status to prevent maternal and infant mortality, as a healthy mother will give birth to a healthy child and thus a healthy population. To improve health status among premenopausal females in Pakistan and to reduce maternal, infant mortality. It is the need of time to discover all the risk factors associated with infant and maternal mortality. Although, multiple studies have proved the cause and association of this disease but there is no research has been conducted locally. However, this study has the potential to generate some significant results that can enhance and facilitate future studies that will be conducted to generate an association between any of those factors and disease outcomes. This study was carried out using secondary data available in Tertiary care hospital, to understand and evaluate the physical, social, and nutritional factors associated with microcytic anaemia premenopausal patients in population. The results of this study would be discussed on gross roots to improve the health status of our premenopausal females.

The objective of the study was to identify and evaluate the prevalence of Iron deficiency anaemia as a reason among microcytic anaemia premenopausal patients.

METHODS

A Cross-sectional study was carried out at the Civil Hospital, Karachi in 2019. The duration of the study was 12 months i.e. October, 2018 to December, 2019. It was conducted after the ethical approval from the Ethical and Review Board of the SZABIST, Karachi.

Sample size: The estimated sample size was 377, calculated through RAOSOFT software, with a 95% confidence level, 5% margin of error, and 50% response distribution. Since particular statistics of population is not available, the sample size was calculated through an estimated population size of 20000.
Sampling technique

Non-probability consecutive sampling technique was used for the sample collection.

Inclusion criteria

Premenopausal female patients presenting with microcytic anaemia as per the criteria were included in the study from out-patient clinics age ranged between 13-45 years.

Exclusion criteria

Patients with known hemoglobinopathies, females of age less than 13 years, and more than 45 years, females with a recent history of blood loss or with any other disease-causing anaemia like Chronic kidney disease (CKD) and GI Bleed were excluded from the study.

A total of 377 patients fulfilling the inclusion criteria from the Outpatient Department of Medicine, Civil Hospital, Karachi were included in the study receiving approval from the ethical review committees. A written informed consent was obtained explaining the benefits of the study. All data were entered manually into the computer and was thoroughly reviewed by the researcher.

Confidentiality is for the safety of the data, the file was properly secured with a password and only known to the researcher.

Basic demographics like age, gender, place of residence and duration of anaemia was taken. Each participant’s height in meters was measured using a stadiometer and weight to the nearest kilogram was measured using the weighing machine at the time of enrolment and BMI was calculated.

A blood sample was drawn by the researcher by using 5 cc disposable syringes and drew 5 ml of blood from a peripheral vein and collected in a specific tube and the sample was transported to the hospital’s standardized laboratory by proper labeling as well as the investigation requested. The report was collected and patients were sorted as having iron deficiency anaemia as per the criteria. The findings of quantitative variables like (age, height, weight, BMI, haemoglobin level, and duration of anaemia) and qualitative variables like (residence status, socioeconomic status, educational level, occupational status, marital status, BMI status, and iron deficiency anaemia) was entered in the performa.

Statistical analysis

Data was analyzed on SPSS Version 20. Mean and standard deviations were calculated for the quantitative variables like age, height, weight, BMI, haemoglobin level, and duration of anaemia. Frequencies and percentages were calculated for the qualitative variables residence status, socioeconomic status, educational level, occupational status, marital status, BMI status, and iron deficiency anaemia. Effect modifiers were controlled through stratification of age, residence status, socioeconomic status, educational level, occupational status, marital status, BMI status, and duration of anaemia to see the effect of these on the outcome variable. Post-stratification chi-square test was applied. P-value of≤0.05 was taken as significant.

RESULTS

A total number of 377 patients who had microcytic anaemia visiting Civil Hospital, Karachi, and met the inclusion criteria were included in this study.

Out of 377 patients, the minimum age was 13 while the maximum age was 45 years. The mean age in our study was 29.28 years with a standard deviation of±6.14. Mean duration of anaemia, haemoglobin, height, weight, and BMI in our study was 1.41±0.26 months, 9.27±0.86 mg/dl, 26.72±1.56 kg/m², 138±7.28 cm and 78.7±9.87 kg respectively (Table 1).

Out of 377 patients with microcytic anaemia, 144 (38.2%) and 233 (61.8%) had and did not have iron deficiency anaemia. Frequency distribution of age showed that out of 377 patients with microcytic anaemia, 188 (49.9%) and 189 (50.1%) patients were in age group 13-30 years and 31-45 years respectively. Frequency distribution of duration of anaemia showed that out of 377 patients with microcytic anaemia, 231 (61.3%) and 146 (38.7%) had anaemia for<1 month and>1 month respectively. Frequency distribution of educational status showed that out of 377 patients with microcytic anaemia, 273 (72.4%) and 104 (27.6%) had residence in urban and rural areas respectively (Table 2).

Frequency distribution of socioeconomic status showed that out of 377 patients with microcytic anaemia, 18 (4.8%), 93 (24.7%), 88 (23.3%), 118 (31.3%) and 60 (15.9%) belonged to the socioeconomic group of lower-income, lower middle income, middle income, upper middle income and upper-income group respectively. Frequency distribution of occupational status showed that out of 377 patients with microcytic anaemia, 146 (38.7%) and 231 (61.3%) were employed and unemployed respectively (Table 2).

Frequency distribution of marital status showed that out of 377 patients with microcytic anaemia, 176 (46.7%) and 201 (53.3%) were married and unmarried respectively. Frequency distribution of educational status showed that out of 377 patients with microcytic anaemia, 134 (35.5%), 80 (21.2%), 101 (26.8%), and 62 (16.4%) belonged to illiterate, primary, secondary and higher educational group respectively. Frequency distribution of BMI status showed that out of 377 patients with microcytic anaemia, 246 (65.3%) and 131 (34.7%) had BMI<27 kg/m² and>27 kg/m² respectively (Table 2).
Stratification for age to iron deficiency anaemia showed that 78 (54.2%) and 66 (45.8%) in age group 13-30 years and 31-45 years had iron deficiency anaemia respectively. Whereas 110 (47.2%) and 123 (52.8%) in the age group 13-30 years and 31-45 years did not have iron deficiency anaemia respectively. P value was 0.11 (Table 3).

Table 1: Descriptive statistics (n=377).

| Variable                      | Mean ±SD | Standard deviation | Min-max |
|-------------------------------|----------|--------------------|---------|
| Age (years)                  | 29.28 ±6.14 | 13-45              |
| Duration of anaemia (months) | 1.41 ±0.26 | 0.4-2              |
| Hemoglobin mg/dl             | 9.27 ±0.86 | 06-11              |
| BMI (kg/m²)                  | 26.72 ±1.56 | 23-29              |
| Height (cm)                  | 138 ±7.28  | 128-158            |
| Weight (kg)                  | 78.7 ±9.87 | 68-115             |

Table 2: Demographic variable (n=377).

| Demography                | Number | Percentage |
|---------------------------|--------|------------|
| IDA                        | Yes    | 144        | 38.2     |
|                           | No     | 233        | 61.8     |
| Age                       | 15-30 years | 188        | 49.9     |
|                           | 31-45 years | 189        | 50.1     |
| Duration of anaemia       | <1month | 231        | 61.3     |
|                           | >1month  | 146        | 38.7     |
| Residential status        | Urban   | 273        | 72.4     |
|                           | Rural   | 104        | 27.6     |
| Occupational status       | Employed | 146        | 38.7     |
|                           | Unemployed | 231        | 61.3     |
| Marital status            | Married  | 176        | 46.7     |
|                           | Unmarried | 201        | 53.3     |
| BMI status                | ≤27 kg/m² | 246        | 65.3     |
|                           | >27 kg/m² | 131        | 34.7     |
| Educational status        | Illiterate | 134        | 35.5     |
|                           | Primary  | 80         | 21.2     |
|                           | Secondary | 101        | 26.8     |
|                           | Higher   | 62         | 16.4     |
| Socio-economic status     | Lower   | 18         | 4.8      |
|                           | Lower middle | 93         | 24.7     |
|                           | Middle   | 88         | 23.3     |
|                           | Upper middle | 118        | 31.3     |
|                           | Upper   | 60         | 15.9     |

Stratification for duration of anaemia to IDA showed that 89 (61.8%) and 55 (38.2%) who had a duration of anaemia for <1 month and >1 month had iron deficiency anaemia respectively. Whereas, 142 (60.9%) and 91 (39.1%) who had a duration of anaemia for <1 month and >1 month did not have iron deficiency anaemia adequate and inadequate knowledge respectively. P value was 0.47 (Table 4).

Table 3: IDA according to age (n=377).

| Age (years) | IDA | Total |
|-------------|-----|-------|
|             | Yes | No    |
| 13-30       | 78  | 110   | 188 (49.9%) |
| 31-45       | 66  | 123   | 189 (50.1%) |
| Total       | 144 (100%) | 233 (100%) | 377 (100%) |
| P value     | 0.11|       |

Table 4: IDA according to duration of anaemia (n=377).

| Duration of anaemia | IDA | Total |
|---------------------|-----|-------|
|                     | Yes | No    |
| <1 month            | 89  | 142   | 231 (61.3%) |
| >1 month            | 55  | 91    | 146 (38.7%) |
| Total               | 144 (100%) | 233 (100%) | 377 (100%) |
| P value             | 0.47|       |

Table 5: IDA according to residential status (N=377).

| Residence status | IDA | Total |
|------------------|-----|-------|
|                  | Yes | No    |
| Urban            | 115 | 158   | 273 (72.4%) |
| Rural            | 29  | 104   | 134 (27.6%) |
| Total            | 144 (100%) | 233 (100%) | 377 (100%) |
| P value          | 0.00|       |

Table 6: IDA according to socioeconomic status (n=377).

| Socioeconomic status | IDA | Total |
|----------------------|-----|-------|
|                      | Yes | No    |
| Lower income         | 6   | 12    | 18 (4.8%) |
| Middle income        | 38  | 55    | 93 (24.7%) |
|                      | 37  | 51    | 88 (23.3%) |
| Upper income         | 42  | 76    | 118 (31.3%) |
| Total                | 144 (100%) | 233 (100%) | 377 (100%) |
| P value              | 0.80|       |

Stratification for residential status to IDA showed that 115 (79.9%) and 29 (20.1%) who lived in urban and rural areas had IDA respectively. Whereas, 158 (67.8%) and 75 (32.2%) who lived in urban and rural areas did not have IDA respectively. P value was 0.00 (Table 5).
Stratification for socioeconomic status to IDA showed that 96 (4.2%), 38 (26.4%), 37 (25.7%), 42 (29.2%) and 21 (14.6%) patients who were in income status group lower, lower-middle, middle, upper-middle and upper-income group had iron deficiency anaemia respectively. Whereas, 12 (5.2%), 55 (23.6%), 51 (21.9%), 76 (32.6%) and 39 (16.7%) who were in income status group lower, lower-middle, middle, upper-middle and upper-income group did not have iron deficiency anaemia respectively. P value was 0.24 (Table 8).

Table 7: IDA according to occupational status (n=377).

| Occupational status | IDA | Total |
|---------------------|-----|-------|
|                     | Yes | No    |       |
| Employed            | 70  | 76    | 146   |
|                     | (48.6%) | (32.6%) | (38.7%) |
| Unemployed          | 74  | 157   | 231   |
|                     | (51.4%) | (67.4%) | (61.3%) |
| Total               | 144 | 233   | 377   |
|                     | (100%) | (100%) | (100%) |
| P value             | 0.00 |       |       |

Stratification for marital status to IDA showed that 70 (78.6%) and 76 (32.6%) who were married had and did not have iron deficiency anaemia respectively. Whereas, 74 (51.4%) and 157 (67.4%) who were unemployed had and did not have iron deficiency anaemia respectively. P value was 0.01 (Table 7).

Table 8: IDA according to marital status (N=377).

| Marital status | IDA | Total |
|----------------|-----|-------|
|                | Yes | No    |       |
| Married        | 71  | 105   | 176   |
|                | (49.3%) | (51.7%) | (46.7%) |
| Unmarried      | 73  | 128   | 201   |
|                | (50.7%) | (48.3%) | (53.3%) |
| Total          | 144 | 233   | 377   |
|                | (100%) | (100%) | (100%) |
| P-value        | 0.24 |       |       |

Stratification for educational status to IDA showed that 76 (52.8%), 21 (14.6%), 26 (18.1%), and 21 (14.6%) were in educational status group illiterate, primary, secondary and higher had iron deficiency anaemia respectively. Whereas, 58 (24.9%), 59 (25.3%), 75 (32.2%), and 41 (17.6%) who were in educational status group illiterate, primary, secondary, and higher did not have iron deficiency anaemia respectively. P value was 0.24 (Table 8).

Table 9: IDA according to educational status (n=377).

| Education status | IDA | Total |
|------------------|-----|-------|
|                  | Yes | No    |       |
| Illiterate       | 76  | 58    | 134   |
|                  | (52.8%) | (49.3%) | (35.5%) |
| Primary          | 21  | 59    | 80    |
|                  | (14.6%) | (25.3%) | (21.2%) |
| Secondary        | 26  | 75    | 101   |
|                  | (18.1%) | (32.2%) | (26.8%) |
| Higher           | 21  | 41    | 62    |
|                  | (14.6%) | (17.6%) | (16.4%) |
| Total            | 144 | 233   | 377   |
|                  | (100%) | (100%) | (100%) |
| P-value          | 0.00 |       |       |

Stratification for BMI status with respect to iron deficiency anaemia showed that 106 (73.6%) and 38 (26.4%) who had BMI<27 kg/m² and >27 kg/m² had IDA respectively. Whereas, 140 (60.1%) and 93 (39.9%) who had BMI<27 kg/m² and >27 kg/m² did not have IDA respectively. P value was 0.00 (Table 10).

Table 10: IDA according to BMI status (n=377).

| BMI status | IDA | Total |
|------------|-----|-------|
|            | Yes | No    |       |
| <27 kg/m²  | 106 | 140   | 246   |
|            | (73.6%) | (60.1%) | (65.3%) |
| >27 kg/m²  | 38  | 93    | 131   |
|            | (26.4%) | (39.9%) | (34.7%) |
| Total      | 144 | 233   | 377   |
|            | (100%) | (100%) | (100%) |
| P-value    | 0.00 |       |       |

DISCUSSION

Anaemia is one of the common treatable complications with erythropoietin and iron deficiencies being the major causes. IDA develops when there is an imbalance in supply and demand. It usually occurs during periods of increased demand or decreased intake. It progressively develops in three stages: storage iron depletion, iron-deficient erythropoiesis, and iron deficiency anaemia. The health burden of IDA is prevalent globally and is a major health concern in Pakistan. Several factors contribute to its development. Its prevalence varies by age and socioeconomic status. In premenopausal women, careful screening is required to identify the cause. Pakistan is a low-middle income country and based on statistics from other countries and the above-mentioned reports, the financial burden is assumed to be quite significant.

Our study included a total of 377 patients who had microcytic anaemia. Mean age, duration of anaemia, haemoglobin, height, weight and BMI in our study was 29.28±6.14 years, 1.41±0.26 months, 9.27±0.86 mg/dl, 26.72±1.56 kg/m², 138±7.28 cm and 78.7±9.87 kg. Out of 377 patients with microcytic anaemia, 144 (38.2%) and 233 (61.3%) had and did not have iron deficiency anaemia respectively (Table 7).
Another Chinese study included 3591 pregnant women and 3721 premenopausal women. The study found the prevalence of iron deficiency anaemia to be 42.6% and 19.1% in pregnant women, while 34.4% and 15.1% in premenopausal non-pregnant women respectively. The prevalence of iron deficiency in iron deficiency anaemia was higher in urban than rural population. Moreover, iron deficiency anaemia was higher in early pregnancy then late. It was higher in lower socioeconomic population than other economic groups.  

Another local study evaluated the multiple determinants of iron deficiency anaemia. The factors were nutritional status, poor socioeconomic status, high parity of women, and access to poor health. It showed that fetuses of pregnant women with anaemia were at risk of developing poor fetal-neonatal outcomes like stillbirth, preterm birth. Iron deficiency anaemia is one of the important public health problems in developing countries among the women of the reproductive age group. Multiple factors like age, parity, socioeconomic status, and diet can determine the stores of iron in the women of the reproductive age group. Anaemia can lead to multiple adverse outcomes, which can be prevented by doing appropriate cost-effective interventions on time.

Anaemia is a condition in which the number of red blood cells and haemoglobin is not to meet the physiological need of the body like transport of oxygen. Women in their reproductive age are particularly at risk of developing iron-deficiency anaemia especially pregnant women are at a high risk. The mean (±SD) haemoglobin concentration was 12.13 g/dL (±1.48). Overall, about 41% (95% CI 38.6–43.0%) of women aged 15–49 years were anaemic. The high prevalence of Anaemia suggests the need for substantial improvement in the nutritional status of women.

Another study done in Bangladesh the intake of iron was much higher than the RDA level and mainly based on non-haem iron. Blood haemoglobin, serum iron and serum ferritin were affected by socio-economic status. Prevalence of anaemia ranged from 63 to 70%. Menstrual loss, high menstrual flow, and pregnancy put women at risk of iron deficiency and iron-deficiency anaemia. Anaemia is highly prevalent in the general population and clinical setting. It is associated with diminished quality of life, worsening of clinical outcomes, and increased health care costs. Iron deficiency is the predominant culprit, and iron deficiency alone may cause fatigue, RLS, and impaired cognitive function. Iron deficiency anaemia should be treated upon diagnosis, and treatment should be considered for iron deficiency without anaemia when it is symptomatic.

**CONCLUSION**

Based on our findings, iron deficiency anaemia appears to be a significant and prevalent health problem affecting premenopausal females in Pakistan. Several factors contribute to its development amongst them as the majority of the female have menstrual irregularities. Available results of this study show prevalent iron deficiency in women of childbearing age contributing to maternal mortality and morbidity in Pakistan.

Being resource-limited developing country poverty, malnutrition, illiteracy, inadequate infrastructure and lack of policy and legislation lead to the development of anaemia. If a premenopausal woman does not respond to oral iron treatment, they must be evaluated for iron loss (blood loss and/or malabsorption). Intravenous route should be used for the administration of iron in these patients. New guidelines and policies are needed to support timely intervention in the form of increased awareness, education, and supplementation and fortification program in this population.

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**REFERENCES**

1. World Health Organization. The prevalence of anaemia in women: a tabulation of available information. 2015; Geneva, WHO 1992.
2. Eisenstaedt R, Penninx BW, Woodman RC. Anaemia in the elderly: Current understanding and emerging concepts. Blood Rev. 2006;2:213-26.
3. World Health Organization. The Global Prevalence of Anaemia in 2011. Geneva, Switzerland: World Health Organization; 2015. Available at: http://apps.who.int/iris/bitstream/10665/177094/1/9789241564960_eng.pdf. Accessed on 15 June 2020.
4. Basturk A, Kutluacan L, Kutluacan A, Pekin AT, Akinci S, Daghi M, et al. Evaluation of pregnant women awareness about anaemia and factors affecting the development of anaemia. Eur J Health Sci. 2016;2(1):1-4.
5. Karakus V, Giden A, Ersil SD, Bozkurt S, Kurtoglu E. Evaluation of anaemia in terms of etiology, risk factors, and relapse in adult patients. Mugla Med J. 2016;3:1-6.
6. Massawe SN, Urassa EN, Nyström L, Lindmark G. Anaemia in women of reproductive age in Dar-es-Salaam, Tanzania. East Afr Med J. 2002;79(9):461-6.
7. Erdem O, Bucaktepe EG, Kara IH. Family medicine clinic women attending the iron deficiency anaemia and gestation story relations. J Dicle Med. 2009;36:123-6.
8. Bhandari S, Sayami JT, Thapa P, Sayami M, Kandel BP, Banjara MR. Dietary intake patterns and nutritional status of women of reproductive age in Nepal: findings from a health survey. Arch Public Health. 2016;74:2.
9. Gereklioğlu C, Asma S, Korur A, Erdogan F, Kut A. Medication adherence to oral iron therapy in...
patients with iron deficiency anaemia. Pak J Med Sci. 2016;32(3):604-7.
10. Fraser IS, Mansour D, Breymann C, Hoffman C, Mezzacasa A, Petraglia F. Prevalence of heavy menstrual bleeding and experiences of affected women in a Europe-anagan survey. Int J Gynecol Obstet. 2015;132(3):196-200.
11. Sekhar DL, Murray-Kolb LE, Kunselman AR, Weisman CS, Paul IM. Differences in risk factors for anaemia between adolescent and adult women. J Women's Health. 2016;25(5):505-13.
12. Bodnar LM, Scanlon KS, Freedman DS, Siega-Riz AM, Cogswell ME. High prevalence of postpartum anaemia among low-income women in the United States. Am J Obstet Gynecol. 2001;185(2):438-43.
13. Stevens GA, Finucane MM, De-Regil LM, Paciorek CJ, Flaxman SR, Branca F, et al. Nutrition Impact Model Study Group (Anaemia). Global, regional, and national trends in haemoglobin concentration and prevalence of total and severe anaemia in children and pregnant and non-pregnant women for 1995–2011: a systematic analysis of population-representative data. Lancet Glob Heal. 2013;1(1):16-25.
14. Nguyen PH, Casanova-Gonzalez I, Pharm H, Truong TV, Nguyen S, et al. Multicultural etiology of anaemia among women of reproductive age in Vietnam. Euro J Clin Nutr. 2015;69(1):107-13.
15. Lone FW, Qureshi RN, Emanuel F. Maternal anaemia and its impact on perinatal outcome. Trop Med Int Heal. 2004;9(4):486-90.
16. Lone FW, Qureshi RN, Emmanuel F. Maternal anaemia and its impact on perinatal outcome in a tertiary care hospital in Pakistan. East Medit Heal J. 2004;10(6):801.
17. Baig-Ansari N, Badruddin SH, Karmaliani R, Harris H, Jehan I, Pasha O, et al. Anaemia prevalence and risk factors in pregnant women in an urban area of Pakistan. Food Nutrit Bull. 2008;29(2):132-9.
18. Unicef data. Maternal mortality. 2020. Available at: <https://data.unicef.org/topic/maternal-health/maternal-mortality/>. Accessed on 22 June 2020.
19. Alvarez-Uria G, Naik PK, Midde M, Yalla PS, Pakam R. Prevalence and severity of anaemia stratified by age and gender in rural India. Anemia. 2014;2014:176182.
20. Zhao L, Zhang X, Shen Y, Fang X, Wang Y, Wang F. Obesity and iron deficiency: A quantitative meta-analysis. Obes Rev. 2015;16(12):1081-93.
21. Kara IH, Baltaci D, Sayin S, Yilmaz A, Celer A, Karacaş MS, et al. Investigation of haematological and biochemical parameters in obese women of reproductive age. J Konuralp Med. 2012;4:1-7.
22. Gebre A, Mulugeta A. Prevalence of Anaemia and Associated Factors among Pregnant Women in North Western Zone of Tigray, Northern Ethiopia: A Cross-Sectional Study. J Nutr Metabol. 2015:1-7.
23. Taha A, Azhar S, Lone T, Murtaza G, Ali Khan S, et al. Iron deficiency anaemia in reproductive age women attending obstetrics and gynaecology outpatient of the university health centre in Al-Ahsa, Saudi Arabia. Afr J Tradit Complement Altern Med. 2014;11(2):339-42.
24. Camaschella C. Iron-deficiency anaemia. N Engl J Med. 2015;372:1832-43.
25. Republic of Turkey State Planning Organization of the National Food and Nutrition Strategy Working Group Report. 2003. s:43: DPT:2670.
26. Wintrobe MM, Lukens JN, Lee GR. The approach to the patient with anaemia. In: Lee GR, Bithell TC, Foerster J, Athens JW, Lukens JN, editors. Wintrobe’s Clinical Hematology. 8th ed. Philadelphia, PA: LeaandFebiger; 1993.
27. Kulnigg S, Gasche C. Systematic review: managing anaemia in Crohn’s disease. Aliment Pharmacol Ther. 2006;24(11-12):1507-23.
28. Gasche C. Anaemia in IBD: the overlooked villain. Inflamm Bowel Dis. 2006;6(2):142-50.
29. De Nicola L, Minutolo R, Chiodini P et al. SINT- TABLE CDK Study Group. Prevalence and prognosis of mild anaemia in non-dialysis chronic kidney disease: a prospective cohort study in outpatient renal clinics. Am J Nephrol. 2010;32(6):533-40.
30. Saydam BK, Genc RE, Sarac F, Turfan EC. Prevalence of anaemia and related factors among women in Turkey. Pak J Med Sci. 2017;33(2):433-8.
31. Liao QK. Prevalence of iron deficiency in pregnant and premenopausal women in China: a nationwide epidemiological survey. Zhonghua Xue Ye Xue Za Zhi. 2004;25(11):653-7.
32. Gautam S, Min H, Kim H, Jeong H-S. Determining factors for the prevalence of anaemia in women of reproductive age in Nepal: Evidence from recent national survey data. PLoS ONE. 2019:14(6): e0218288.
33. Mawani M, Ali SA, Bano G, Ali SA. Iron Deficiency Anaemia among Women of Reproductive Age, an Important Public Health Problem: Situation Analysis. Reprod Syst Sex Disord. 2016:5:187.
34. Borch-Johnsen B, Meltzer HM, Stenberg V, Reinskou T. Iron status in women during menstruating women Eur. J. Clin Nutr. 1990:44:23-726.

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