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Original Research Article

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

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ABSTRACT

Background: Iron deficiency anaemia (IDA) is the prevalent form of anaemia which has become a major public health problem, globally. Women in the reproductive age group (15–49 years of age) are at increased risk, especially in the South Asian population. It is of paramount importance to identify these micronutrient deficiencies in this age group as it adversely affects the birth outcomes, but the mother and the child at risk of morbidity and mortality during pregnancy.
Methods: A cross-sectional study was conducted at Civil Hospital, Karachi for 12 months i.e. October, 2018 to December, 2019. Data was prospectively collected from patients after obtaining written informed consent. 377 patients were included who met the diagnostic criteria. Descriptive statistics were used and qualitative data analysis; mean, standard deviation, frequency, and percentages were respectively calculated. Effect modifiers were controlled through stratification to see the effect of these on the outcome variable. For post-stratification, the chi-square test was applied with a p value of≤0.05.
Results: A total of 377 patients with microcytic anaemia were enrolled from Civil Hospital, Karachi. 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/m^2, 138±7.28 cm and 78.7±9.87 kg. Out of 377 patients with microcytic anaemia, 144 (38.2%) and 233 (61.8%) had and did not have iron deficiency anaemia.
Conclusions: IDA is frequently found in microcytic anaemia patients. Thus, it is important to screen premenopausal in female patients for iron deficiency presenting with microcytic anaemia to prevent adverse outcomes.

Keywords: Microcytic anaemia, Iron deficiency anaemia, Premenopausal patients, Tertiary Care Hospital, Karachi

INTRODUCTION

One of the most common preventable nutritional factors resulting as risk factors for a high mortality rate worldwide is anaemia.[1] 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).[2-9]

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 Pakistan is an important geopolitical country lying at the crossroads of various civilizations. It is burdened with a large population with limited resources and expenditure on health and education. Hence prevalence is the major tool to overcome IDA among vulnerable female populations. Both the factors put a significant population at risk of iron deficiency anaemia especially females.[9-14]

Pakistan has been reported with a high maternal mortality ratio of 178 deaths per 100 thousand live births in the year 2015 and 74.9 under 5 mortality rate per 1000 live births according to UNICEF data.[18] One of the major causes is nutritional deficiency causing anaemia.[16]

Patients presenting with microcytic anaemia usually have iron-deficiency anaemia which could be attributed to diet, impaired absorption or decreased supply or increased demand of iron.[2-9]

Iron deficiency anaemia (IDA) is the leading cause of nutritional deficiency worldwide approximately 700 to 800 million. It puts an economic strain on the health care expenditure resulting in substantial health and economic loss. Depending on the age group of females it can result in mortalities, affect school performance, impair growth and above all severely impacts the pregnant females in the developing countries.[19-21]

An economic audit of IDA showed that although it can be managed with a timely diagnosis. However, misdiagnosis, delayed diagnosis or hospitalization could increase the cost of health care. Severe iron deficiency anaemia not managed appropriately impacts a woman's physical, mental, and social health that mainly includes: cognitive development and neurological malfunction, fatigue, and growth retardation.[4-14,22-26] It can also cause impaired resistance and increased susceptibility to infection due to defective leukocyte phagocytosis.[27-29] Any woman presenting with symptoms suggestive of anaemia requires that blood samples be drawn for diagnostic purposes and provide them with need-based treatment. The treatment plan should not only include dietary and lifestyle advice but should also involve reproductive health information with the goal being to improve and enhance women's health. [4,22-26]

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/m^2, 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 residential 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/m^2)	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 (54.2%)	110 (47.2%)	188 (49.9%)
31-45	66 (45.8%)	123 (52.8%)	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 (61.8%)	142 (60.9%)	231 (61.3%)
>1 month	55 (38.2%)	91 (39.1%)	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 (79.9%)	158 (67.8%)	273 (72.4%)
Rural	29 (20.1%)	75 (32.2%)	104 (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	06 (4.2%)	12 (5.2%)	18 (4.8%)
Lower middle income	38 (26.4%)	55 (23.6%)	93 (24.7%)
Middle income	37 (25.7%)	51 (21.9%)	88 (23.3%)
Upper middle income	42 (29.2%)	76 (32.6%)	118 (31.3%)
Upper income	21 (14.6%)	39 (16.7%)	60 (15.9%)
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 06 (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 0.80 (Table 6).

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

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

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

Marital status	IDA		Total
	Yes	No	
Married	71 (49.3%)	105 (45.1%)	176 (46.7%)
Unmarried	73 (50.7%)	128 (54.9%)	201 (53.3%)
Total	144 (100%)	233 (100%)	377 (100%)
P-value	0.24		

Stratification for occupational status to iron deficiency anaemia showed that 70 (78.6%) and 76 (32.6%) who were employed 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).

Stratification for marital status to iron deficiency anaemia showed that 71 (49.3%) and 105 (45.1%) who were married had and did not have iron deficiency anaemia respectively. Whereas, 73 (50.7%) and 128 (54.9%) who were unmarried had and did not have IDA respectively. P value was 0.24 (Table 8).

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 0.00 (Table 9).

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

Education status	IDA		Total
	Yes	No	
Illiterate	76 (52.8%)	58 (24.9%)	134 (35.5%)
Primary	21 (14.6%)	59 (25.3%)	80 (21.2%)
Secondary	26 (18.1%)	75 (32.2%)	101 (26.8%)
Higher	21 (14.6%)	41 (17.6%)	62 (16.4%)
Total	144 (100%)	233 (100%)	377 (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/m^2 and>27 kg/m^2 had IDA respectively. Whereas, 140 (60.1%) and 93 (39.9%) who had BMI<27 kg/m^2 and>27 kg/m^2 did not have IDA respectively. P value was 0.00 (Table 10).

BMI status	IDA		Total
	Yes	No	
< 27 kg/m^2	106 (73.6%)	140 (60.1%)	246(65.3%)
> 27 kg/m^2	38 (26.4%)	93 (39.9%)	131 (34.7%)
Total	144 (100%)	233 (100%)	377 (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 (61.8%) had and did not have iron deficiency anaemia. A study conducted in Turkey showed that women during the 15-49 years 27.8% had anaemia. Among these women, the prevalent cause was iron deficiency anaemia (56%). It was further observed that they had a history of menstruation, cesarean section. They concluded that to prevent anaemia in this population is to provide relevant information and well-planned interactive educational programs. [30]

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.[31]

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 feto-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.[32]

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.[33]

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%.[34] 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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