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Comparison of Serum Zinc and Iron Levels Among Pregnant Women of Rural and Urban Areas Visiting Tertiary Care Hospital Jamshoro

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ABSTRACT

Nearly two-thirds of pregnant women in underdeveloped nations suffer from anemia, which increases the risk of maternal illness and death as well as low birth weight for the baby. **Objective:** Hospitalized pregnant women from rural and urban locations were compared for iron and serum zinc levels in this study. **Methods:** Total 146 pregnant women were presented in this Comparative Cross sectional study. This study was conducted in Department of Pathology, Laboratory, Liaquat University of Medical and Health Sciences, Jamshoro, Hyderabad. A red tip simple tube and Ethylenediaminetetraacetic acid (EDTA) were used to disperse 10 milliliters of blood sample. Cobas 601 was used for the analysis of serum iron. Micro Lab 300 was used for the analysis of zinc and copper. **Results:** There were 66 (45.2%) females had age 21-25 years, followed by 32 (22%) cases had age 26-30 years, 28 (19.1%) cases had age 17-20 years and 20 (13.7%) cases had age >30 years. There were 96 (65.8%) cases had history of consuming iron folic acid. There were 67 (45.9%) cases had good meal intake per day. Anemia was found in 103 (75.5%) cases. It was found that deficiency of serum zinc in 86 (58.9%) cases. Frequency of serum ferritin level was severe low in 44 (42.7%) cases, 49 (47.5%) cases had low serum ferritin level and normal ferritin level was only observed in 10 (9.8%) cases. **Conclusions:** it was found that pregnant women have increased anemia rates. Rural pregnant women are more likely than metropolitan ones to have this condition.

INTRODUCTION

Among the many nutritional deficiency disorders that affect people around the world, anemia ranks high. While nutritional anemia can impact people of any age or gender, it disproportionately impacts women and is associated with low birthweight, maternal morbidity, and mortality [1]. Nutritional anemia is a serious health problem that impacts a large percentage of pregnant women in impoverished nations. The estimated frequency of anemia among non-pregnant women in underdeveloped countries is about 50% [1]. Nevertheless, a number of these women were already anemic before they became pregnant. According to reports, 26% of ever-married women in Pakistan's metropolitan areas and 47% of rural women suffer from anemia [2]. Anemia is similarly common among metropolitan pregnant women, with rates ranging from 29% [3] to 50% [4, 5] among those who visit antenatal clinics at a big private tertiary hospital in Karachi. Women in developing nations are more likely to experience anemia during pregnancy, and the causes of this condition vary greatly among regions [6]. The physiologic needs of the fetus and the expansion of the mother blood volume during pregnancy exacerbate iron deficiency, which is a result of chronic poor food intake and menstruation and is the main cause of anemia during pregnancy globally [6, 7]. Other variables include hereditary predisposition and inadequate personal cleanliness, both of which might increase the risk of infections and infestations [7]. Anemia has multiple causes, but one of them is a lack of iron in the body, which can happen when women don't eat enough. Iron deficiency is more common in women of childbearing age because of

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menstruation, and it becomes even more of a problem during pregnancy because of the increased metabolic demands and fetal growth. The World Health Organization has suggested that all women and girls in areas where the anemia burden is greater than 20% receive iron supplements as a means of combating the epidemic [8-10]. Despite the fact that various initiatives were able to lessen the worldwide impact of anemia by 12% from 1992 to 2011, these efforts failed to assist WRA residing in LMICs [10]. Further, iron's potential to alleviate anemia among WRA in LMICs is the subject of a plethora of epidemiological investigations, some of which are randomized controlled trials (RCTs). Although some meta-analyses and systematic reviews have synthesized the results of these RCTs, there are certain limitations and gaps in the meta-analyses conducted during the previous decade. Women who were pregnant were not included in this review; however, pregnant women who suffer from anemia throughout pregnancy and need to take extra precautions to prevent the detrimental effects on the mother and unborn child caused by iron deficiency anemia were not included either. On the other hand, non-pregnant women were left out of a different systematic review that was conducted in 2015 [11]. There is some evidence that observational cohort and quasi-experimental studies, which were heavily relied upon in the meta-analysis may have introduced residual and unmeasured confounding into the conclusions regarding the efficacy of iron therapy. Last but not least, a meta-analysis on the effects of iron treatment on women's physical exercise was carried out by Pasricha et al., in 2014, instead of focusing on iron deficiency markers as an outcome [12]. When compared to other South Asian countries, Pakistan has an even smaller percentage of pregnant women who take iron or folic acid supplements [13]. According to the available data, about 3,190 disability-adjusted life years (DALYs) may be prevented in the short and long term if iron supplementation was made available to women in order to reduce the prevalence of iron deficiency anemia [14]. To achieve this goal, first identify the demographics most impacted by iron deficiency anemia and the factors that tend to lead people to take iron supplements. There is a lack of national-level studies on the factors associated with iron consumption among women, especially during pregnancy, and while there is some evidence on the predictors of iron deficiency anemia among Pakistani women [15], our understanding of the factors is very limited overall. Despite research showing that iron supplements can help pregnant women with anemia, no studies in Pakistan have looked at what factors are linked to taking iron supplements while pregnant. This highlights the importance of conducting thorough research into the factors that influence iron consumption in Pakistan. To improve iron intake by pregnant women, it is necessary to have a comprehensive understanding of these factors. Only then can local strategies and specific interventions be developed.

Therefore, the purpose of this research was to examine what factors in Pakistani pregnant women are most likely to use iron supplements for at least 90 days. Furthermore, it was investigated these indicators in both rural and urban areas since it was hypothesized that they may differ depending on where people lived.

METHODS

This Comparative cross sectional study was conducted at Department of Pathology, Laboratory, Liaquat University of Medical and Health Sciences, Jamshoro, Hyderabad. Duration of 6 months, from July 2023-December 2023 with Reference No. LUMHS/REC/-40. A single population percentage sample size calculation formula was used to estimate the prevalence of zinc deficiency. The formula took into account the following factors: a 95% confidence level, a 5% margin of error, a 10% non-response rate, and an expected prevalence of 66.7% of zinc deficiency [23]. Pregnant women with age 17-45 years of rural and urban areas, those provided written consent with no chronic disease in history were included while non pregnant women of gynecological problems, women with diabetic disease or skin infection were excluded from this study. This study was conducted after ethical approval by the ethical review committee of LUMHS and a well-versed written consent was taken from the study patient or next of kin. A structured proforma was used for both cases and comparative group to collect data. A red tip simple tube and Ethylene diamine tetra acetic acid (EDTA) were used to disperse 10 milliliters of blood sample. Cobas 601 was used for the analysis of serum iron. Micro Lab 300 was used for the analysis of zinc and copper. Zinc present in the sample was chelated by 5-Br-PAPS. 2-(5-bromo-2-pyridylazo)-5-(N-sulfopropylamino) -phenol in the reagent. The formation of this complex was measured at a wave length of 560nm. Quantitative determination of iron in human serum are performed on Roche/Hitachi cobas c systems. Serum zinc deficiency was defined as <50 µg/dl and serum iron deficiency was defining as < 11 µg/dl. Data were analyzed by using SPSS version 23.0. Frequencies and percentages were used for categorical variables. T-test was used to compare the difference of outcome variables among (rural/urban) areas. P-value <0.05 was considered as statistically significant.

RESULTS

There were 66 (45.2%) females had age 21-25 years, followed by 32 (22%) cases had age 26-30 years, 28 (19.1%) cases had age 17-20 years and 20 (13.7%) cases had age >30 years (Figure 1).

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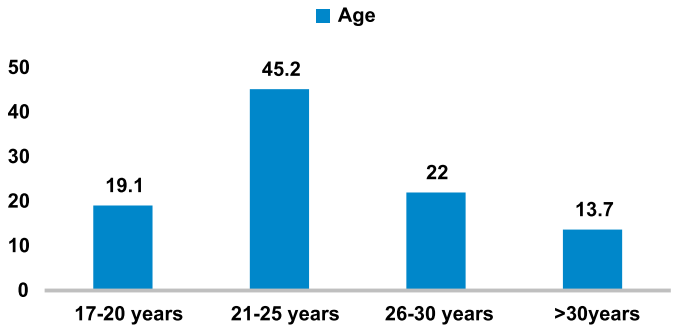

Figure 1: Distribution of study participants according to age ranges

Among all, 61 (41.8%) cases were had third trimester. Frequency of multi-gravidity was found in 95 (65%) cases. There were majority 107 (73.3%) cases had no any miscarriage/abortion history. Majority of the cases 102 (69.8%) were housewives. 112 (76.7%) cases had low socio-economic status. 95 (65.1%) cases had rural residency (Table 1).

Table 1: Demographics of the Pregnant Females (n=146)

Variables	N (%)
Trimester	
First	40 (27.4%)
Second	45 (30.8%)
Third	61 (41.8 %)
Multi-Gravida	
Yes	95 (65 %)
No	51 (35%)
Miscarriage/Abortion History	
Yes	39 (26.7%)
No	107 (73.3%)
Housewives	
Yes	102 (69.8%)
No	44 (30.2%)
Socioeconomic Status	
Poor	112 (76.7%)
Good	34 (23.3%)
Residence	
Rural	95 (65.1%)
Urban	51 (34.9%)

There were 96 (65.8%) cases had history of consuming iron folic acid. There were 67 (45.9%) cases had good meal intake per day (Table 2).

Table 2: Meal Intake and History of Consuming Iron/ Folic Acid (n=146)

Variables	N (%)
Consumption of Iron / Folic Acid	
Yes	96 (65.8%)
No	50 (34.25)
Meal Intake /Day	
Poor	67 (45.9%)
Good	79 (54.1%)

It was found that deficiency of serum zinc was reported in 86 (58.9%) cases. Higher percentage of deficiency was found in women of rural areas 34.2% as compared to urban resident with p value <0.005 (Table 3).

Table 3: Deficiency of Serum Zinc

Variables	Rural	Urban
Serum Zinc N (%)		
Normal	45 (30.8%)	15 (10.3%)
Deficient	50 (34.2%)	36 (24.7%)

Anemia was found in 103 (75.5%) cases (Figure 2).

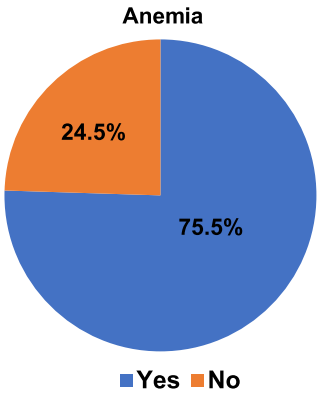

Figure 2: Frequency of Anemia among study participants

Frequency of serum ferritin level was severe low in 44 (42.7%) cases, 49 (47.5%) cases had low serum ferritin level and normal ferritin level was only observed in 10 (9.8%) cases. Significantly higher proportion was seen in women of rural areas with p value <0.05 (Table 4).

Table 4: Association of serum Ferritin Levels with residential status among Pregnant Cases

Variables	Rural	Urban	p-value
Serum Ferritin Level N (%)			
<12ng/mL	30 (29.1%)	14 (13.6%)	0.024
12-30ng/mL	33 (32.03%)	16 (15.5%)	0.018
31-300ng/mL	3 (2.9%)	7 (6.8%)	0.685
Total	66 (64.1%)	37 (35.9%)	0.002

DISCUSSION

Prevalence of anemia in this study was much higher than reported by Agrizzi VT *et al.*, from Tanzania. They reported a prevalence of 18.0% among the pregnant women in their study [16]. Anemia was one of the world's most prevalent prenatal diseases, with dietary iron deficiency being the most common factor. Maternal anemia has been linked to an increased like hood for both maternal and newborn complications. There are several factors that determine maternal nutritional status are multifaceted, and each one's influence changes depending on dietary habits, region, socio-demography, and season. The overall prevalence of anemia among pregnant women in the present study was 70.5% of which the majority of them were from rural settings compared to urban. This finding

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was consistent with findings reported by Kumar A *et al* [17]. Our findings related to the prevalence of anemia among pregnant women are consistent with previous studies carried out in different rural areas of the country, where the prevalence of anemia was reported to be between 41.0% and 77.0 % [18]. In our study, 21–25 years and 26–30 years age groups were found to be the most affected groups and categorized as high-risk groups as the majority of pregnant women with anemia were from this group. These findings are consistent with those reported by Wu S et al [19]. Our study demonstrated that the majority (37.0%) of participants have meat once a week while 27.7% of them never take meat. Another Pakistani study reported that the majority of their participants weren't consuming meat and they found a significant relation between meat consumption status and anemia among pregnant women. iron: heme iron, which was mostly found in foods containing animal flesh, and non-heme iron, which was the only type present in plant-based foods [20]. Moreover, most (52.7%) participants in our study replied that they never consumed green leafy vegetables, and 56.2% replied they take milk and its products on a regular basis. This may be due to the reason that there are two forms of dietary grains and vegetables. Zinc is a mineral that is essential and is recognized to be vital for the regular physiological processes of immune system. Its deficiency during pregnancy has negative effects on the mother as well as the growing fetus [21-23]. The consequences of the eventual delivery is associated with the adverse outcomes. In underdeveloped nations, zinc deficiency is widespread, and earlier studies have linked pregnancy problems to low maternal blood zinc concentrations.

CONCLUSIONS

It was concluded that prevalence of anemia was significantly high among the pregnant women. This prevalence was much higher among the pregnant women residing in rural areas compare to those residing in urban areas.

Authors Contribution

Conceptualization: SA[1]

Methodology: SA[1], KA

Formal analysis: IDU

Writing, review and editing: SA[2], NM, AHC

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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