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# To Study the Prevalence of Obesity among Anemic Women and Associated Factors

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## Abstract

**Background:** Iron deficiency and anemia are frequent findings in subjects with progressed stages of obesity. Iron deficiency and anemia may impair mitochondrial and cellular energy homeostasis and further increase inactivity and fatigue of obese subjects. Obesity-associated inflammation is tightly linked to iron deficiency and involves impaired duodenal iron absorption associated with low expression of duodenal ferroportin (FPN) along with elevated hepcidin concentrations. The main objective of this study was to assess the prevalence of Obesity among Anemic women. **Subjects and Methods:** The hospital based study was conducted in Government Medical College; Khandwa for a period of one year from 2018 Dec to 2020 Feb. The study population was the females who attended OPD and IPD of general medicine department of government medical college, Khandwa. The number of participants included in this study was two hundred twenty-three (323). The participants were selected randomly from the general medicine department. Data Analysis was done using SPSS software program. Verbal informed consent was obtained from study participants prior to the commencement of the study. **Results:** Among 323 cases, 104 cases are with high BMI value (25.0 and above) with percentage of 32.2%, 180 cases are with normal BMI value (18.5 – 24.9) with 56% percentage and 39 cases are of underweight (18.5 and lower) with percentage of 12%, and p value is > 0.05 in all the categories, which is insignificant. **Conclusion:** There appears no association between BMI and levels of anemia in female patients, any correlation if exists appears to by chance. As both iron deficiency and overload may have detrimental effects on the course of obesity-related conditions, appropriate screening and treatment of both is necessary and maintaining of adequate quality of diet is also important factor to reduce the burden.

**Keywords:** Prevalence, Obesity, Anemia, Women.

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## Introduction

Overweight and obesity are commonly defined by the measurement of BMI. However, this is an imperfect measure, since both fat and fat-free mass (bone, muscles and body water) are estimated. An important limitation of the BMI as a measure of obesity is that it tends to ignore the distinction between fat and fat-free mass. Cut-off levels of the BMI for overweight and obesity are based on the 5th and 95th centiles of body weight and the mortality profile derived from the Caucasian population (World Health Organization, 1995, 1998).[1]

Iron deficiency remains the most common nutritional deficiency and cause of anemia worldwide. Populations in the developing countries, premenopausal females, pregnant women and children recognized obesity as disease, which is prevalent in both developing and developed countries. Overweight and obesity are now so common and thereby replacing the more traditional public health concerns (under nutrition and infectious diseases) as some of most significant contributors to ill health. Both anemia and morbid obesity are epidemic issues whole of the world along with high economic burden on governments.[2]

One of the major recent developments in obesity research is the concept that the disorder is associated with chronic, low-grade, systemic inflammation. Adipose tissue in obesity can be characterized by macrophage infiltration and associated inflammation. Adipocytes are now recognized to be major secretory cells, secreting fatty acids as well as over 50 proteins, collectively referred to as adipokines. A number of adipokines are linked to the inflammatory response, including adiponectin, tumor necrosis factor-α, interleukin-1β (IL-1β), IL-6, IL-8, IL-10, monocyte chemoattractant pro-tein-1, macrophage migration inhibitory factor, nerve growth factor, vascular endothelial growth factor, plasminogen activator inhibitor-1, and haptoglobin.[3]

Presently, body mass index (BMI) and waist circumference (WC) are two criteria that have been employed for classifying obesity. Associations of obesity classified by BMI, defined as general obesity, with chronic diseases and reduced life expectancy have been well documented. BMI provides the most useful population-level measure of overweight and obesity as it is the same for both sexes and

for all ages of adults. Overweight and obesity are defined as abnormal or excessive fat accumulation that may impair health. Overweight and obesity are the fifth leading risk for global deaths. At least 2.8 million adults die each year as a result of being overweight or obese.[4]

The pathophysiology of anemia is diverse and often multifactorial, and possible causes include genetic mutations in hemoglobin genes, acute and chronic blood loss, inadequate nutrients intake, and infectious processes. Of them, iron deficiency is assumed to be the major one. Previous studies have demonstrated that anemia was associated with adverse effects on individuals' well-being, and if left untreated, could cause impaired tissue oxygen delivery and may lead to fatigue, lethargy, concentration of difficulty, impaired physical capacity, poor work performance, and even mental disorders.[5]

Both iron deficiency (ID) and obesity are global epidemics affecting billions with regional disparities. It has become clear that iron deficiency and obesity do not merely represent the coincidence of two frequent conditions but are molecularly linked and mutually affect each other. While obesity has become a socioeconomic burden in industrialized countries over the last century, the prevalence is currently also increasing in developing countries with the spread of energy-dense food compounds and a sedentary lifestyle. The most important sequelae of obesity include cardiovascular diseases, type 2 diabetes (T2DM), and an increased rate of several cancers.[6]

## Subjects and Methods

This study was conducted in Government Medical College; Khandwa. The study was conducted for a period of one year from 2018 Dec to 2020 Feb. Study Design is a hospital based study. The study population of this study was the females who went to general medicine department of government medical college, Khandwa.

**Sampling and Sample Size:** Convenient samples of three - hundred twenty-three (323) participants were asked to participate in the study.

According to ICMR and INDIAN study 2015 obesity prevalence rate varies from 11.8 to 31.3% in India while central obesity rate varies from 16.9% to 36.3% according to the same study.

**Data Analysis:** Data was computed, frequencies were calculated and proportions attained using SPSS software program. Verbal informed consent was obtained from study participants prior to the commencement of the study.

BMI estimates of body fat and is related to risk of disease BMI = Weight in Kgs/ (Height in Meters).[2]

BMI Interpretation: WHO expert committee classified Underweight- Less than 18.5 Kg/m2, Normal or Lean- 18.5-24.9, Pre-obesity- 25.0-29.9,

Obesity class I- 30.0-34.9, Obesity class II- 35.0-39.9 and Obesity class III- above 40.

**Inclusion Criteria:**

- Only females with anemia population included.
- Participants of age group 18-60 females were included.
- All BMI groups included in this study
- Females Participants attended IPD and OPD.

**Exclusion Criteria:**

- Below 18 and Above 60 age group were not included in this study.
- ICU Patients were not included.
- Acute haemorrhage due to any cause excluded.

## Results

**Table 1: Age Distribution of Cases.**

| Age | No of Cases |
|---|---|
| 18 -25 | 65 |
| 26 -35 | 75 |
| 36 -45 | 98 |
| 46 - 60 | 85 |
| Total | 323 |

[Table 1] shows age distribution of cases.18 to 60 years of age group was included in this study. From 18 – 25 years of age group, number of cases was 65, from 26 – 35 years of age group 75 cases, from 36 – 45 years of age group 98 cases and 46 – 60 years of age group 85 cases were present.

**Table 2: Hb values distribution of cases.**

| Hb values (gm %) | No of cases | Percentage |
|---|---|---|
| 5.0 -5.9 | 40 | 12.3% |
| 6.0 – 6.9 | 45 | 13.9% |
| 7.0 – 7.9 | 48 | 14.8% |
| 8.0 – 8.9 | 70 | 21.6% |
| 9.0 and Above | 120 | 37.15% |
| Total | 323 | 100% |

[Table 2] shows Hb level distribution of cases In 40 cases the Hb values are in between 5.0 -5.9, in 45 cases the Hb values are in between 6.0 – 6.9, in 48 cases the Hb values are in between 7.0 – 7.9, in 70 cases the Hb values are in between 8.0 – 8.9 and in 120 cases the Hb values are above 9gm/dl.

**Table 3: Distribution of Pre obese & obese patient among study population.**

| BMI | No of Cases | Percentage |
|---|---|---|
| 25.0 – 29.9 | 52 | 50% |
| 30.0 – 34.9 | 31 | 29.8% |
| 35.0 – 39.9 | 18 | 17.3% |
| Above 40.0 | 03 | 2.88% |
| Total | 323 | 100% |

**Table 4: Distribution of Obesity in all anemic subjects in the study.**

| BMI (Kg/m$^2$) | No of Cases | Percentage | P Value |
|---|---|---|---|
| High BMI (25.0 and above) | 104 | 32.2% | P > 0.05 |
| Normal BMI (18.5 – 24.9) | 180 | 56% | P > 0.05 |
| Underweight (18.5 and lower) | 39 | 12% | P > 0.05 |

[Table 3] shows Body Mass Index. Total numbers of cases were 323 in this study. Among 323, 52 cases had BMI value between 25.0 – 29.9 with 50%.

31 cases had BMI value in between 30.0 – 34.9 with 29.8%.

18 cases had BMI value in between 35.0 – 39.9 with 17.3%. In 03 cases the BMI Values are above 40.0. With 2.88%
[Table 4] shows the Distribution of Obesity in all anemic subjects in the study. Among 323 cases, 104 cases are with high BMI value (25.0 and above) with percentage of 32.2%, 180 cases are with normal BMI value (18.5 – 24.9) with 56% percentage and 39 cases are of underweight (18.5 and lower) with percentage of 12%, and p value is > 0.05 in all the categories, which is insignificant.

## Discussion

Few studies reported that blood hemoglobin levels increase and the chance of becoming anemic lowered with increasing BMI. In contrast, few studies reported the opposite trend of higher prevalence of anemia among obese/overweight women, and few reported no relation. Studies that reported a higher risk of anemia among obese/overweight individuals stressed inflammation theory due to obesity as the vital factor of higher prevalence of anemia. However, the explanation is not satisfactory, why in some studies, the higher hemoglobin level and lower risk of anemia are reported, and others reported the opposite.[7]
Although obese women had a higher intake of iron than underweight women, the average intake of underweight women was still adequate. In contrast, in the Mexican population iron intake was reported to be in the range of 8–9 mg/d. Intake of vitamin C, the most potent enhancer of non-heme iron absorption, was present in sufficient amounts in the diets of Chinese women (60 mg/d), whereas vitamin C intake in Mexican women was low (30 mg/d). It may be that the Chinese diet conveys enough absorbable iron to lower the risk of anemia in contrast to the Mexican diet. Although overweight or obesity in the population may not decrease red-cell survival or impair erythropoiesis, obesity might still result in hypoferremia through hepcidin or other mediators.[8] Hepcidin, in turn, is responsible for low serum iron by decreasing the absorption of iron from the intestinal mucosa and by raising the rate of sequestration of iron in macrophages, but a high ferritin level in correlation to high hepcidin has not yet been explained; however, low-grade chronic inflammation associated with obesity could be responsible for higher serum ferritin; similarly, other studies mention high serum ferritin in those with severe adiposity and consider it an acute-phase reactant that is elevated even if true iron deficiency is present, and its production is induced by many inflammatory cytokines.[9]
To study the association between hemoglobin level and BMI among adolescent age group along with sociodemographic factors and gender differences in 127 school and college students. In our study, mean and standard deviation of 127 participant's age were 15.87 ± 2.592. Minimum ages were 11 and maximum age was 19. Median was 16 and mode was 19. Standard error of mean was 0.23 and variance was 6.7. Gender wise 55.9% were male and 44.1% were female. Mean and standard deviation in male participant's age were 15.75 ± 2.817 and mean and standard deviation in female participant's age were 16.02 ± 2.292.[10]
Previous studies have indicated the practical significance and/or utility of anthropometric indices such as the WC, WHR, and WHtR in predicting the hemoglobin level in patients with different diseases. For instance, Odagiri et al. assessed the associations among the WHtR, hemoglobin level, and chronic kidney disease. They reported significant associations between the WHtR and the hemoglobin level, BP, HDL cholesterol, LDL cholesterol, and hematocrit and identified significant positive associations between quartiles of the WHtR and the hemoglobin, hemoglobin A1C, and fasting plasma glucose levels, BP, and hematocrit.[11]

## Conclusion

There appears no association between BMI and levels of anemia in female patients, any correlation if exists appears to by chance. The iron needs of obese women in developing countries are not being met. The intake of other nutrients may also be insufficient. Abnormal parameters of iron status are frequent findings in overweight and obese subjects. Iron deficiency represents a particular clinical problem when iron requirements are increased. Owing to its underlying mechanism of impaired iron absorption and treatment of iron deficiency by oral supplementation is frequently insufficient. Diet quality is an important issue even among women with sufficient energy intake. As both iron deficiency and overload may have detrimental effects on the course of obesity-related conditions, appropriate screening and treatment of both is advocated.

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