

## HEMOGLOBIN IN RELATION TO BODY MASS INDEX AND SOCIOECONOMIC CHARACTERISTICS AMONG PREGNANT WOMEN

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### ABSTRACT

**Objective:** To determine whether the body mass index (BMI) and hemoglobin (HB) level are associated with socioeconomic strata among pregnant women belonging to different socioeconomic strata.

**Study Design:** A cross-sectional study.

**Place and Duration of Study:** Sheikh Zayed Hospital, National Hospital & Medical Center, and Hameed Latif Hospital Lahore (Punjab; Pakistan), from Mar to Dec 2018.

**Methodology:** A cross-sectional study was conducted on 300 pregnant women of lower, middle and upper class; age range from 15-39 years. Women from all trimesters were included in the study. A self-structured questionnaire was used to collect socio-demographic data about participants of the study. Anthropometric measurements, body mass index (BMI), and hemoglobin (HB) level were evaluated in participants belonging to different socioeconomic status.

**Results:** The study determined that 3% of participants were underweight, 29% had average weight, 45% belong to an overweight category, and 23% were obese as assessed based on BMI values. Hemoglobin level varied from 9.1 mg/dl to 11 mg/dl among participants of different socioeconomic strata. A significant association was observed between BMI, HB level, and socioeconomic status ( $p=0.000$ ). However, there was no significant association observed between BMI and hemoglobin.

**Conclusion:** It was concluded that the body mass index (BMI) and hemoglobin (HB) were significantly associated with socioeconomic conditions of pregnant women but showed no association with each other. This provided the potential for new avenues to improve health status during pregnancy.

**Keywords:** Body mass index, Hemoglobin, Pregnant women, Socioeconomic strata.

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### INTRODUCTION

Pregnancy is a dynamic process which much cares. It is an anabolic process, and during pregnancy, the normal nutritional requirement increases to fulfill the demands of the fetus<sup>1</sup>. In the second trimester of pregnancy and particularly in the third-trimester nutritional demand increases<sup>2</sup>. Literature suggested that during pregnancy, sufficient nutrition is a significant environmental factor that regulates the proper course of pregnancy and fetal development. Nutrition is a key modifiable factor associated with weight-related outcomes in pregnancy<sup>3</sup>.

Nutritional status indicates the overall well-being of a population. During reproductive age, if

poor dietary intake in women can lead to essential nutrients deficiency<sup>4</sup>. Maternal under-nutrition, particularly in the developing countries is the most significant causes of maternal mortality and morbidity because it has a direct association with fetal nutrition. Malnutrition transfers from one to the next generation, and malnourished babies are born from malnourished mothers<sup>5</sup>.

Pregnancy complications are mostly seen more in those women who are overweight or obese<sup>6</sup>. For pregnant women, maternal age is considered a significant determinant of nutritional status. This condition may lead to various types of life threatening complications<sup>7</sup>. Healthy babies are born from well-nourished mothers with normal weight of 2500 gm. While malnourished mothers will give birth to underweight babies. Therefore, to get healthy babies mother's nutritional

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status before and during pregnancy as well as through the lactating period must be kept adequate<sup>8</sup>. Pregnancy nutritional status can be classified based on BMI, according to the criteria: underweight (BMI <18.5 kg/m<sup>2</sup>), normal-weight (18.5 kg/m<sup>2</sup>-24.9kg/m<sup>2</sup>), overweight (25kg/m<sup>2</sup>-29.9 kg/m<sup>2</sup>), and obesity (BMI ≥30 kg/m<sup>2</sup>)<sup>9,10</sup>. The waist to hip ratio (WHR) is used to measure the body fat distribution. This ratio is a measurement of subcutaneous tissues as well as intra abdominal adipose tissues. Pregnancy complications arise among those women who have higher WHR than normal<sup>11</sup>.

Socioeconomic status and overweight or obese pre-pregnancy were strongly associated with each other<sup>12</sup>. In Pakistan. However, it was seen that obesity has an association with higher socioeconomic status<sup>13</sup>. In high income and middle-income countries, the percentage of overweight and obese pregnant women has increased<sup>14</sup>. Globally; obesity is increasing day by day in many regions of countries. It has become a global health problem. In Pakistan, the percentage of overweight and obese females is higher than males. Women from rural areas show less burden of obesity as compared to women from urban areas<sup>15</sup>.

In Pakistan in 2013, 38.4% overweight and 14.3% obese women were observed<sup>16</sup>. According to previous studies in Pakistan, maternal obesity prevalence was very high. Therefore, this study was conducted to determine the association between BMI (Body Mass Index), hemoglobin, and socioeconomic strata among pregnant women belonging to different socioeconomic strata. In turn, this study will help to make nutrition education policies and create awareness regarding proper weight maintenance among pregnant women in order to reduce pregnancy complications, mortality, and morbidity rate. It is important to update maternal knowledge and understanding about nutrition during pregnancy to enhance life quality.

## METHODOLOGY

The purpose of this study was to determine the association between BMI, hemoglobin, and

socioeconomic strata among pregnant women belonging to different socioeconomic strata. The institutional ethics review committee approved the study on September 12, 2018 with ref no: IRB-UOL-FAHS/372/2018. A written consent was taken from the participants after explaining the purpose of the study. It was a cross-sectional study that was conducted at the national hospital and medical center, Sheikh Zayed hospital, and Hameed Latif Hospital, Lahore. The sample size was calculated by using the formula: sample size  $n = \frac{Z^2 pq}{d^2}$ .

The data was collected from 300 pregnant women of the childbearing age belonging to the lower, middle, and upper class. Those women who did not meet the study criteria and those who disagree with the following study protocols were not included. To collect the socio-demographic data and anthropometric measurements, a questionnaire was prepared. From a participant's height and weight body mass index (BMI) was calculated, which was a vital indicator of the nutritional status of the population<sup>17</sup>. In this study, participants were categorized into underweight (BMI <18.5), average weight (18.5-24.99), overweight (25.0-29.99) and obese (≥30.0) for the analysis<sup>10</sup>.

The biochemical evaluation of hemoglobin level was taken from their medical record. All the women were informed that the information was kept confidential, and data obtained from them will be used only for research purpose.

## Statistical Analysis

By using the statistical program package for the social sciences (SPSS 22), statistical analysis was performed. Quantitative data were represented as mean and standard deviation. Percentages were computed for the qualitative variables. The cross-tabulations with chi-square tests included in the analyses between variables to check the level of significance. It included cross-tabulations of BMI and socioeconomic strata, Hemoglobin levels, and socioeconomic strata and between BMI and hemoglobin levels. A *p*-value <0.05 set as statistically significant.

**RESULTS**

The data was collected from 300 participants. According to socio-demographic data, about 33.3% of the participants belong to upper class (100000 - >150,000 pkr), 33.3% were from middle class (50,000 - 10, 0000 pkr) and 33.3% were from lower class (<20,000 - 50,000 pkr). Among them,

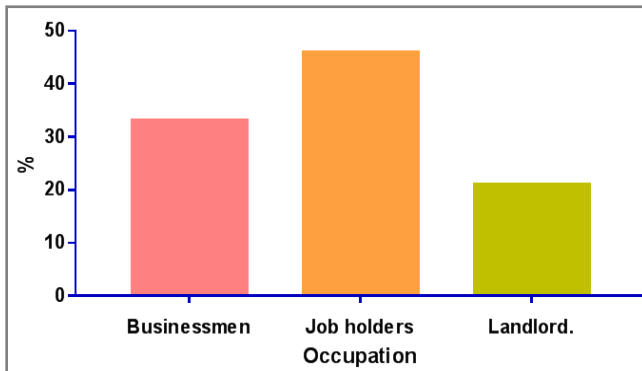


Figure-1: Participants husband occupation.

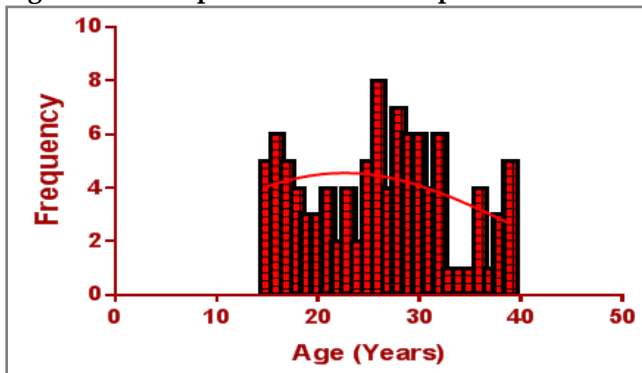


Figure-2: Participant age histogram.

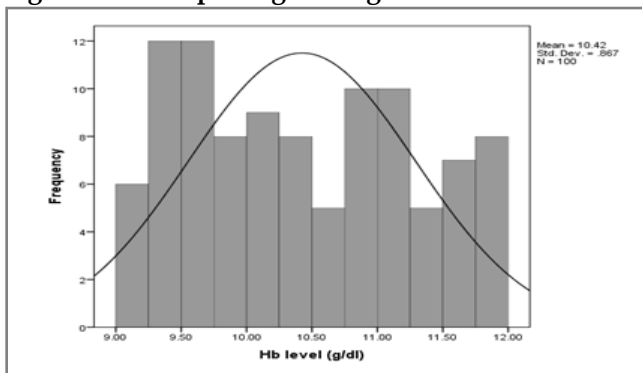


Figure-3: Hemoglobin level in participants.

82% were living in an urban area, and 18% were living in a rural area. Mostly participants father/husband were a service provider (fig-1).

Women from all trimesters were included in the study. Their mean age was  $25 \pm 7.2$  (fig-2) and

weight  $72.45 \pm 9.169$ . The mean height among participants was seen  $63.47 \pm 1.934$ . The mean WHR was seen  $0.7915 \pm 0.2419$ . The minimum level of hemoglobin was 9.1 g/dl, while the maximum level was observed 11.9 g/dl (fig-3).

A significant association was observed between BMI and socioeconomic strata ( $p < 0.05$ ). Similarly, the association between hemoglobin level and socioeconomic strata was also observed ( $p < 0.05$ ). However, there was no significant association observed between BMI and hemoglobin.

**DISCUSSION**

To researcher knowledge, there was limited data in Pakistan related to pregnant women nutritional status. The study determined the association between BMI, hemoglobin level, and socioeconomic strata among pregnant women. Pregnancy is a critical period in the life of women. In this stage, if proper health status cannot be monitored, it can lead to several health complications, including birth defects, miscarriage, maternal and infant mortality.

The results of the present study were compatible with a previous one. A dietary intervention study was conducted in Australia. They stated that almost 50% of the women were overweight. In the end, they concluded that nutrition intervention would be helpful in improving the quality of diet for maternal obesity<sup>18-19</sup>. A study was conducted in 2017 to find out maternal obesity outcomes on pregnancy. Pregnant women with the age range of 18-40 were considered in the study. The results showed that 72.1% were overweight, 23.1% were obese<sup>20</sup>. A similar study was conducted in different areas of Bangladesh to analyze the nutritional status of pregnant women. The purpose of the study was to find out the nutritional status difference between urban-rural women. In different stages of pregnancy, their weight gain was calculated. The results of the study revealed that women from urban population were over-weight and obese than women from rural population during pregnancy<sup>21</sup>.

The present study results were consistent with a previous study. In 2018 an observational

study was conducted for the comparison of anthropometric measurements in different socioeconomic strata. In the study, 7268 participants with mean age, 23 years were selected. The results showed that women from lower socioeconomic status were underweight, while women from higher socioeconomic status were overweight<sup>22</sup>. Another study was conducted to determine the association between socioeconomic status and body mass in the United States. They stated that obesity has a direct association with socioeconomic status among Asians. In the end, they concluded that BMI and socioeconomic status had a significant association<sup>23</sup>. The present study results are compatible with previous studies. In present study 46% participants were (8-10 g/dl) Hb, 44% were (10-11 g/dl) Hb, and 10% were (11-12 g/dl) Hb level. The results of the chi-square test showed a significant association between hemoglobin level and socioeconomic strata. A similar study was conducted in Baluchistan in 2015. It was a randomized survey in which 132 participants were included. In the study, it was observed that the majority of the participants were from the middle/poor class. In the end, they concluded that socioeconomic status and hemoglobin were significantly associated with each other<sup>24</sup>.

In the current study, it was also analyzed whether BMI and hemoglobin level had an association with each other or not. The results revealed that BMI and hemoglobin level were not associated with each other, as shown in a previous study. In that study, 32.2% had normal weight, while 37.7% and 30.1% were overweight/obese, respectively. The results of the previous study described that BMI and hemoglobin were not correlated<sup>19</sup>. The results of another previous study explained that BMI and hemoglobin were not associated with each other. That study was conducted in Nigeria in 2017. A total of 215 young adults within the age range of 17-45 were selected. The results of their study showed that there was no relationship between hemoglobin and body mass index<sup>25</sup>. The result of present study contradicts some other previous studies in

which they found the association between hemoglobin and BMI (Body Mass Index).

The study provides insight to explore the association between anthropometric measurements, Hb, and socioeconomic strata among pregnant women. Other risk factors identified in the present study, such as low hemoglobin and nutritional status of these pregnant women would be helpful for planning more intervention programs. Among pregnant women, the prevalence of obesity, which is increasing day by day is a serious health issue, as it may affect both the mother and the infant. The less attention has given to this socioeconomic dimension; therefore; the aim of this study was to analyze the association between the socioeconomic characteristics and Hb among pregnant women. The effective nutrition intervention included; awareness regarding ideal weight gain and nutrient intake should be directed towards pregnant women to improve maternal nutritional status.

## CONCLUSION

It was concluded that the Body Mass Index (BMI) and hemoglobin (HB) were significantly associated with socioeconomic conditions of pregnant women but showed no association with each other.

## CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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