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COMPARATIVE STUDY OF HEMOGLOBIN LEVELS AMONG RURAL AND URBAN POPULATIONS

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ABSTRACT

Hemoglobin is an important constituent of blood that carries oxygen and lack of which results in anemia, which is a significant public health issue of concern in both rural and urban populations. The current research was designed to compare the level of hemoglobin in rural and urban populations and determine the level and degree of anemia in the rural and urban population. It used a comparative cross-sectional design and a total number of 120 respondents in the study were considered with half of them living in rural (n=60) and urban (n=60) regions. Standard laboratory measures were used to estimate the level of hemoglobin and were categorized as normal, mild anemia, moderate anemia and severe anemia. Frequency and percentage distribution were used to analyze the data. The results showed that general prevalence rate of anemia was 60%. The rural respondents had a higher anemia rate (70%) than the urban respondents (50%). The rural population was 33.3% mild anemia, 28.3% moderate anemia and 8.4 severe anemia as compared to the urban population 30% mild anemia, 16.7% moderate anemia and 3.3% severe anemia. The research concludes that rural populations are susceptible of low hemoglobin levels and greater severity of anemia as compared to urban populations. The findings highlight the necessity of specific nutritional treatment, regular checkup, and enhanced anemia prevention strategies, particularly in rural regions to decrease the burden of anemia and enhance the levels of personal health.

Keywords- *Hemoglobin, Anemia, Rural Population, Urban Population, Comparative Study, Prevalence, Severity of Anemia*

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1. INTRODUCTION

Hemoglobin is a vital protein with iron contained in red blood cells, which is very important in the normal physiological functioning. It is primarily used to carry oxygen to different tissues and organs of the body as well as the transportation of carbon dioxide back to the lungs. Sufficient levels of hemoglobin are thus essential in maintaining energy, physical stamina, mental capacity, immune system, and metabolism, in general. A decrease in hemoglobin level below the advised level causes anemia, which decreases blood oxygen bearing capacity and causes fatigue, weakness, loss of concentration, dizziness and low work efficiency among others. Anemia is still one of the greatest worldwide health issues, and it occurs more often in the developing countries because of nutritional deficit and unfair access to available health provisions.

The determinants affecting the hemoglobin levels are too many and they include nutritional factors, biological factors, as well as environmental and socioeconomic factors. The largest role is played by dietary habits and the quality of the nutrition since the production of hemoglobin requires iron, folic acid, vitamin B12, and proteins. The socioeconomic status influences availability of food, nutritional diversity and availability of iron enriched foods. Likewise, the state of sanitation and hygiene can affect an individual to infection particularly parasitic infection like hookworm that may cause chronic blood loss and iron depleted stores. The level of hemoglobin is also highly influenced by health consciousness and healthcare consumption as frequent screening, early diagnosis, and treatment will avoid the development of anemia. Moreover, age, sex, pregnancy, menstrual blood loss, and reproductive condition are biological factors that are highly affecting hemoglobin levels, which makes women and adolescents very susceptible populations.

The anemia burden in the rural and urban populations is usually dissimilar because of the difference in the lifestyles of the populations and availability of resources. Poor dietary intake, low intake of ironed rich and protein rich foods, poverty, diminished health literacy and insufficient health infrastructure, are often associated with low hemoglobin levels in rural areas. There is also the possibility of increased number of cases of worm infestations, insecure drinking water, and late access to preventive care and supplementation programs by rural populations which also predispose them to anemia. In addition, women in the rural areas can

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be given inadequate/inadequate antenatal and postnatal care, which causes them to be more iron deficient during pregnancy and after giving birth to a baby. All these factors increase the risk of becoming mildly anaemic to severely anaemic in the rural population.

Urban population, on the contrary, has better access to hospitals, diagnostic services, health education, and fortified foods, and this may prevent worse hemoglobin status. Nevertheless, the risk factors that might affect hemoglobin levels negatively may also be introduced by an urban lifestyle. Nutritional imbalance and ineffective iron absorption could be caused by increased intaking of fast foods, unhealthy eating habits, lack of physical exercise, stress, and sedentary lifestyle. Moreover, overcrowding, inadequate sanitation, and absence of access to quality health services in slums of a metropolis may ensure the prevalence of anemia does not decrease, which means that anemia cannot be considered as a rural health concern but a challenge relevant in both cases.

Hence, comparative analysis of hemoglobin levels in rural population and urban population becomes very important in terms of comprehending the differences in population as well as determining the vulnerable groups. This type of studies allow to estimate the prevalence of anemia, measure the distribution of the severity and emphasize the role of geographical and socio-economical variation in the status of hemoglobin. Comparative research is essential in the ways that the findings are used to come up with specific interventions that include the use of nutrition supplementation programs, the distribution of iron and folic acid, deworming programs, strengthening of maternal health and raising awareness. Finally, the analysis of rural-urban differences in hemoglobin data will serve as useful information to the public health planning and help to decrease the prevalence of anemia and enhance the general health condition of a community.

1.1.Factors Influencing Hemoglobin Levels

The level of hemoglobin is established as a complicated combination of diet, biological, environmental, and socio-economic conditions. Proper consumption of necessary nutrients is an important role in ensuring that hemoglobin levels are normal. The red blood cells cannot be synthesized or mature without iron, folic acid and vitamin B12, as well as the proteins. Persons whose diet lacks diversity or those who do not have adequate intake of iron-rich foods like

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green leafy vegetables, legumes, meat, eggs as well as fortified cereals are at greater risk of developing low hemoglobin levels. This issue is prevalent among the rural populations because of food insecurity and those in urban populations because of poor dietary practices.

The most prevalent cause of low hemoglobin levels in the world is iron deficiency. Nevertheless, the production of hemoglobin does not only rely on the consumption of iron but the shortage of other micronutrients like folic acid and vitamin B12 also disrupt the production of the red blood cells. Besides this, dietary factors like taking tea or coffee frequently, foods rich in phytates, and foods rich in calcium can be taken together with iron rich foods to inhibit iron absorption. Such eating behaviors decrease the bioavailability of iron, and lead to chronic low hemoglobin distribution despite an adequate iron intake.

Chronic and parasitic diseases have a major impact on the level of hemoglobin, especially in developing areas. Continuous blood loss or destruction of red blood cells due to infestations by intestinal worms, malaria and other chronic infections result in anemia. Sanitation, lack of clean drinking water, and access to preventive health services make such infections more susceptible, particularly to rural communities and residents of urban slums.

Hemoglobin is also influenced by biological factors especially those affecting gender and reproductive health. The vulnerability of women to anemia is caused by the loss of menstrual blood, the higher level of iron demanded during pregnancy and lactation, and the recurrence of pregnancies without proper nutritional replenishment. Unsuitable antenatal health care and inconsistent consumption of iron and folic acid pills further deteriorate the hemoglobin cases in women.

The socioeconomic status, as well as the level of education, has a strong impact on the hemoglobin levels due to the quality of diet, health awareness, and service use. People with low socioeconomic statuses are usually limited in terms of finances, which restrict their access to healthy food and healthcare. The education is less, which means that there is less awareness on the issue of balance diets, prevention of anemia and the need to have a regular health check up, thus exposing the patient to the risk of low hemoglobin content in the body.

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1.2.Objectives Of the Study

1. To compare hemoglobin levels among rural and urban populations and assess the prevalence of anemia.
2. To determine and compare the **mean hemoglobin levels** in rural and urban participants.
3. To assess and compare the **prevalence of anemia** in rural and urban populations.
4. To classify the **severity of anemia** (mild/moderate/severe) among the study participants.

2. REVIEW OF LITERATURE

Tesfaye, Tessema, and Jarso (2020) assessed a comparative cross-sectional study in Ethiopia to find out prevalence of anemia and its predictors in apparently healthy rural and urban inhabitants. The research paper indicated that anemia was a major health issue in both the locations, though the rate was relatively higher among rural dwellers. The authors have found that there were various contributory factors including deficiency in nutrition, socioeconomic status, as well as inaccessibility to health services, which affected hemoglobin status. These results highlighted the fact that rural populations were more susceptible to anemia because they had poor dietary habits and low levels of healthcare-seeking behavior.

Shedole (2017) conducted a cross-sectional study on the commonality of anemia in adolescent female teenagers in high school in Davangere, Karnataka urban and rural. The findings showed that anemia was extremely high among adolescents with rural girls showing high prevalence rate than the urban girls. The study indicated poor dieting, low awareness on diet and absence of supplementation programs among the prevalent factors that cause anemia in rural settings. The study has found out that anemia in adolescent girls was a severe social health concern and needed specific intervention initiatives particularly in rural areas.

Zou et al. (2016) studied rural urban variations in body mass index (BMI) and anemia in children and adolescents. Their results showed that there was a definite difference between the prevalence of anemia in rural and urban population. The analysis revealed that children and adolescents in the rural areas had a greater risk of anaemia than those in the urban areas. The

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authors implied that the presence of nutritional quality, socioeconomic development, and health services disparity between urban and rural settings could potentially be a significant cause contributing to the observed differences in hemoglobin levels and anemia status.

Singh, Singh, and Kaur (2015) assessed and compared knowledge, attitude, and practice on iron deficiency anemia between the rural and urban medical students. The researchers found out that students who had urban background tended to be more aware and understand iron deficiency anemia compared to those who had rural background. The researchers identified gaps in the body of knowledge and practice in relation to dietary iron consumption and prevention of anemia particularly among the rural background participants. The paper has ended by concluding that awareness and education could be of significance in the prevention of iron deficiency anemia and improvement of hemoglobin status.

3. RESEARCH METHODOLOGY

The current literature was carried out to contrast hemoglobin values between the rural and urban people as well as determining the level and extent of anemia between the two groups. Quantitative method has been employed and the participants are categorized according to the hemoglobin levels estimated through laboratory in terms of normal anemia, mild anemia, moderate anemia and severe anemia. The data obtained were analysed in terms of frequency and percentage distribution with the aim of knowing the relative pattern of anemia of rural and urban dwellers.

3.1. Research Design

The study employed a cross-sectional research design that was comparative. This design was appropriate to compare and contrast hemoglobin status of the rural and urban populations at one occasion.

3.2. Study Area

The research was conducted in the chosen rural and urban locations. The participants were chosen in rural communities, that is, village communities and urban communities, that is,

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town/city residential localities. The two areas were represented equally to facilitate a comparative analysis.

3.3. Study Population

The population used in the study consisted of people who lived in rural and urban places. Both male and female participants who were within the chosen age bracket were taken into account. The sample was divided into two groups in terms of residential background rural and urban.

3.4. Sample Size and Sampling Technique

There were 120 participants in the study who were evenly distributed to allow a fair comparison.

- Rural participants: 60
- Urban participants: 60

The sample size consisted of purposely sampled rural and urban participants who were chosen through a purposive sampling method with a set of criteria.

4. DATA ANALYSIS

The study involved 120 participants to compare the level of hemoglobin of the rural and urban populations. The researcher employed hemoglobin estimated laboratory values to categorize the study participants into normal, mild anemia, moderate anemia and severe anemia samples. The patterns were interpreted using frequency and percentage distribution to analyse data.

Table 1: Distribution of Participants by Area (N = 120)

Area of Residence	Frequency (n)	Percentage (%)
Rural	60	50.0%
Urban	60	50.0%
Total	120	100%

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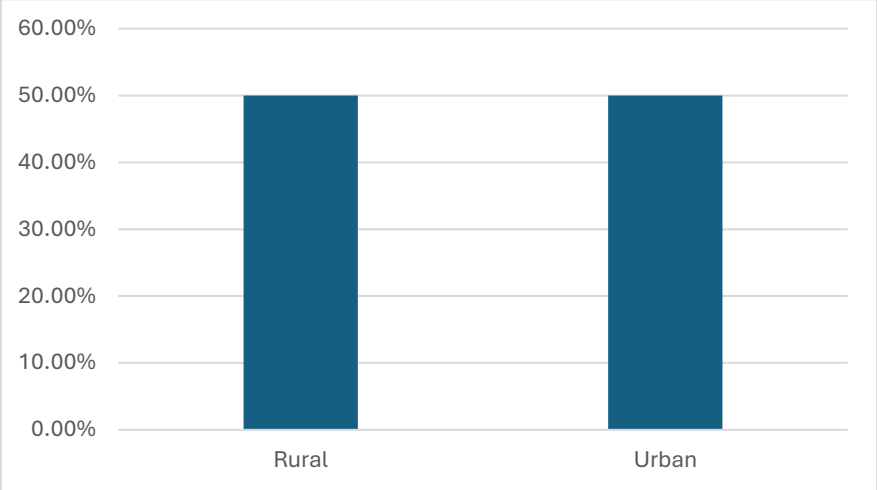

Figure 1: Graphical presentation of Distribution of Participants by Area

Table 1 demonstrates the sample size based on the location of residence. The sample size of 120 students was split into 60 participants (50.0%) and 60 (50.0%) participants. This balanced representation of the study across the two populations implies that the study was well balanced in both populations and this contributes to the comparative aspect of the research and enables comparative levels of hemoglobin and prevalence of anemia between the rural and urban populations.

Table 2: Distribution of Hemoglobin Status Among Rural Population (n = 60)

Hemoglobin Status (Rural)	Frequency (n)	Percentage (%)
Normal Hb	18	30.0%
Mild Anemia	20	33.3%
Moderate Anemia	17	28.3%
Severe Anemia	5	8.4%
Total	60	100%

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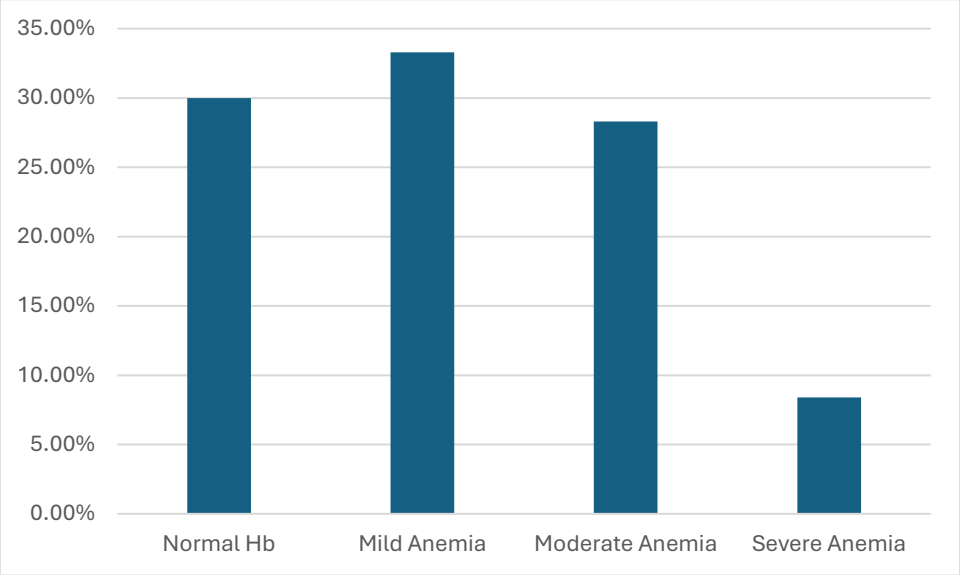

Figure 2: Graphical presentation of Distribution of Hemoglobin Status Among Rural Population

The hemoglobin status between rural participants (n = 60) is indicated in Table 2. It can be seen that there were 18 respondents (30.0%) who were found to be normal in hemoglobin levels and 42 respondents (70.0%) were found to be anemic. In anaemic rural population, mild anemia was the most frequent with 20 participants showing (33.3%), moderate anemia was the second with 17 participants (28.3%). In the case of severe anemia, where 5 participants (8.4%) were afflicted with the condition, it becomes evident that not only anemia is more and more widespread in rural regions, but also it manifests itself in more severe forms suggesting that the nutrition and health levels were worse.

Table 3: Distribution of Hemoglobin Status Among Urban Population (n = 60)

Hemoglobin Status (Urban)	Frequency (n)	Percentage (%)
Normal Hb	30	50.0%
Mild Anemia	18	30.0%
Moderate Anemia	10	16.7%
Severe Anemia	2	3.3%
Total	60	100%

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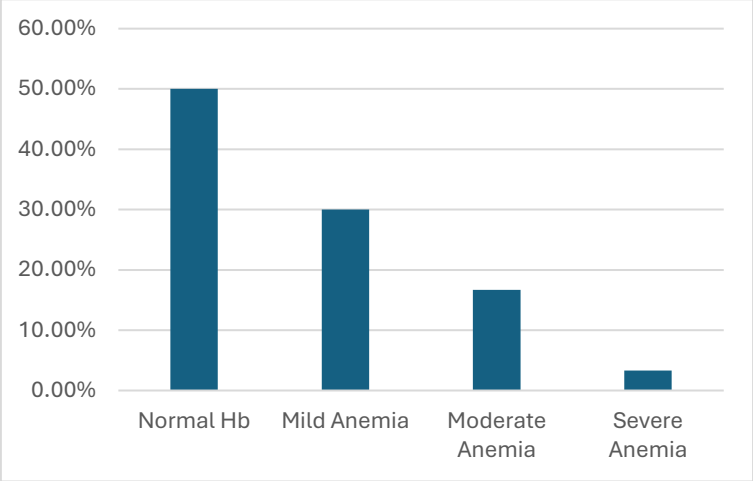

Figure 3: Graphical presentation of Distribution of Hemoglobin Status Among Urban Population

Table 3 explains the hemoglobin condition of the urban participants (n = 60). According to the results, 30 participants (50.0%) were normal in terms of hemoglobin and the other 30 participants (50.0%) were anemic. Moderate anemia was observed in 18 participants in the urban population (30.0%), mild anemia was observed in 10 participants (16.7%), and only 2 participants were found to have severe anemia (3.3%). This reveals that the prevalence rate of anemia is reduced in the urban regions than the rural regions and severe anemia has a relatively lower number, and possibly indicates an easier access to nutrition, sanitation and healthcare centers in urban regions.

Table 4: Comparative Prevalence of Anemia Among Rural and Urban Populations (N = 120)

Area	Normal Hb n (%)	Anemia n (%)	Total
Rural	18 (30.0%)	42 (70.0%)	60
Urban	30 (50.0%)	30 (50.0%)	60
Total	48 (40.0%)	72 (60.0%)	120

Table 4 compares the general level of anemia among rural and urban population. These results make it evident that the prevalence of anemia was more available in rural subjects (70.0%) than in urban subjects (50.0%). Whereas, only 30.0% of rural subjects had normal hemoglobin values, 50.0% of subjects in urban setting had normal values. In general, in both groups, 72

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Impact Factor: 10.1
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participants (60.0%) were anemic and only 48 (40.0%) participants were normal hemoglobin. The given comparative analysis reveals a strong rural-urban disparity in the level of hemoglobin, with rural rural people being more susceptible to anemia and the necessity of the more powerful nutritional and healthcare interventions.

CONCLUSION

The current research is concluded that the hemoglobin and prevalence of anemia are highly different among rural and urban populations. According to the specific laboratory hemoglobin estimation of 120 people (60 rural and 60 urban), the total prevalence of anemia was 60% which shows that anemia is still one of the major problems in the context of the population health. Rural Urban difference was also apparent as those in the rural population had a higher prevalence of anemia (70%) than the urban population (50%), and the rural population had a higher proportion of moderate and severe anemia. Although half of the city population carried the normal hemoglobin level, only 30% of the rural subjects were found to be carrying the normal hemoglobin, indicating a bad hemoglobin situation in the countryside. Such results underscore the importance of special interventions, especially rural ones, including routine hemoglobin screening, better nutrition, iron-folic acid, deworming and health education to minimize the incidence of anemia and enhance the overall health status.

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