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A Survey-Based Study of Hemoglobin Levels among Female Patients in the Murud Janjira Region

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Abstract: *This cross-sectional analytical study evaluated hemoglobin levels among female participants in the Murud Janjira region. Laboratory-confirmed data (n=24) were statistically analyzed. The mean hemoglobin concentration was 11.47 g/dL (SD = 1.88). The Pearson correlation coefficient between age and hemoglobin level was -0.001, indicating a weak linear association. A considerable proportion of participants were classified under mild anemia. Nutritional intake, supplementation practices, and awareness levels were identified as important determinants influencing hemoglobin status.*

Keywords: Hemoglobin, Anemia, Iron Deficiency, Female Health, Cross-Sectional Study, Statistical Analysis

I. INTRODUCTION

Hemoglobin is a tetrameric iron-containing metalloprotein responsible for oxygen transport in humans. Perutz (1970) described its cooperative binding mechanism through quaternary structural changes. Schechter (2008) emphasized its central role in molecular medicine, while Bunn (2013) detailed the molecular pathology of hemoglobin disorders. Anemia remains a major global health issue, particularly among women of reproductive age due to iron deficiency, menstrual loss, and pregnancy-related demands.

II. LITERATURE REVIEW

Ahmed, Ghatgeet al., 2022. provided a comprehensive review of hemoglobin structure and allosteric regulation. Drvenica et al. (2022) discussed extracellular hemoglobin and oxidative implications. Li et al. (2023) explored hemoglobin-based biomaterials in advanced therapeutics. Lee et al. (2025) reported socioeconomic and demographic determinants influencing hemoglobin variability in population-based studies.

An, Y., Janget al., 2019.. A large Korean cohort study (n = 487,643) investigated sex-specific associations between serum hemoglobin (Hgb) levels and cause-specific mortality using NHIS-HEALS data. The study found that **both low and high hemoglobin levels were associated with increased risk of death,** but the patterns differed by sex. In men, U-shaped or J-shaped relationships were observed for cardiovascular diseases, liver disease, COPD, and certain cancers. In women, high Hgb levels were linked to increased COPD mortality, while low levels were associated with hypertension-related death. The findings suggest that abnormal hemoglobin levels-either low or high-may increase mortality risk, and these associations vary between males and females.

Ministry of Health & Family Welfare (MoHFW). A large Indian public-health analysis on anemia among women found that **socioeconomic factors,** especially *household wealth*, significantly influence hemoglobin levels. The study observed a **decline in moderate to severe anemia rates,** suggesting improvements in nutrition and public-health interventions. However, disparities remain based on wealth status, highlighting the need for targeted strategies to reduce anemia among economically disadvantaged women.

Virtanen et al., 2024. This cohort study found that women with PCOS had higher hemoglobin (Hb) levels at age 31 compared to controls, but not at age 46. Higher Hb levels were associated with poorer metabolic markers-including

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BMI, insulin resistance, blood pressure, and lipid levels-in both PCOS and non-PCOS women, with stronger associations in the PCOS group.

Shah SA et al. 2023. This cross-sectional study conducted in Karachi, Pakistan, found that **41.7% of working women (aged 18-45 years) were anemic,** with most cases classified as mild anemia. Dietary habits, stress, occupational factors, and low intake of iron-rich foods were associated with lower hemoglobin levels, highlighting anemia as a significant public health concern among working women.

Netz A et al. 2024. This retrospective study of 2,446 women undergoing major surgery found that preoperative hemoglobin (Hb) levels below 12.9 g/dL were associated with higher rates of blood transfusion, postoperative complications (pneumonia, acute kidney injury, sepsis), and longer hospital stays. The findings suggest that current WHO anemia thresholds for women (<12.0 g/dL) may be too low and should be reconsidered to improve surgical outcomes.

Dalvi S et al. 2025. This large multicentric retrospective study across India (n = 9,283) found that iron deficiency anemia is highly prevalent among women of reproductive age, with most cases classified as mild to moderate. All oral iron salts significantly improved hemoglobin and ferritin levels ($p < 0.001$), with **ferrous fumarate** showing the greatest rise in hemoglobin and best quality-of-life improvement, while maintaining an acceptable safety profile.

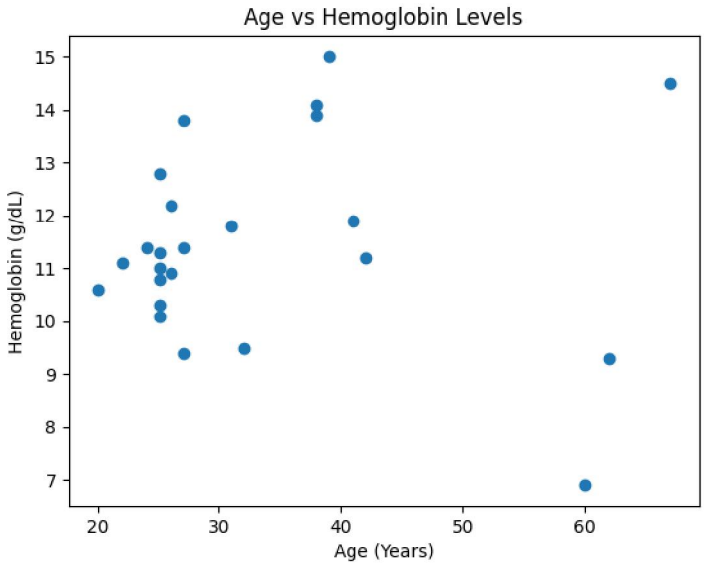
III. METHODOLOGY

A cross-sectional descriptive design was implemented. Hemoglobin estimation was conducted using Cyanmethemoglobin (Drabkin's) method, Sahli's method, and automated hematology analyzers. Reference range for females: 12-16 g/dL. Data were analyzed using descriptive statistics and Pearson correlation analysis.

IV. RESULTS AND DISCUSSION

Hemoglobin values ranged from 6.9 to 15 g/dL. The mean value was 11.47 g/dL with standard deviation 1.88. Pearson correlation coefficient (r = -0.001) indicates weak association between age and hemoglobin level. Mild anemia (10-11.9 g/dL) was the most prevalent category. The findings suggest that nutritional and lifestyle factors exert greater influence than age alone.

Graph 1: Age vs Hemoglobin



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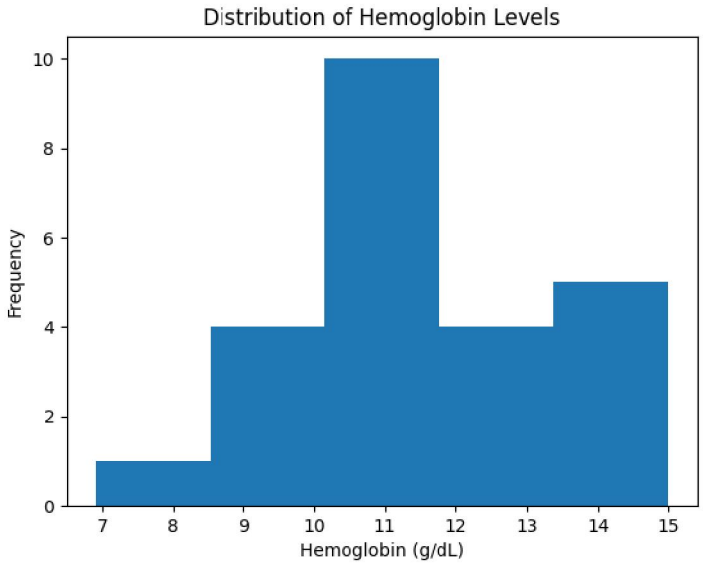
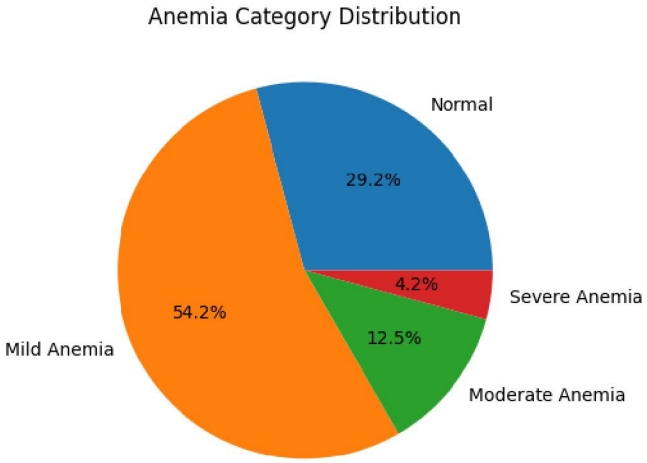
Graph 2: Hemoglobin Distribution



Graph 3: Anemia Category Distribution



IV. CONCLUSION

The study confirms the presence of mild anemia among females in the Murud Janjira region. Statistical analysis demonstrates weak correlation between age and hemoglobin levels. Regular screening, dietary iron intake improvement, and public health awareness programs are recommended to reduce anemia prevalence.

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