Original Research Article

COMPARATIVE ANALYSIS OF SPECIFIC GRAVITY WITH HEMOGLOBIN OF THE BLOOD - CLINICOPATHOLOGICAL ANALYSIS

Running Title: Specific gravity with hemoglobin of the blood

ABSTRACT:

AIM:

The study aims to analyze the specific gravity with the hemoglobin of the blood.

INTRODUCTION:

The ratio of the density of a substance to the density of the water at a specified temperature and pressure is known as specific gravity. Blood is a fluid connective tissue that delivers oxygen and nutrients to the cells and transports metabolic waste away from the cells. Red blood cells are biconcave disc-shaped cells produced from bone marrow. It contains proteins that transport oxygen from the lungs to all the parts of the body. The term heme reforms to the iron-containing porphyrin. The aim of the study was to analyse the specific gravity of Hemoglobin of the blood.

MATERIALS AND METHOD:

10 random blood samples were collected from the patients in Saveetha Dental College. Then the samples were centrifuged and the blood-specific gravity and hemoglobin were analyzed from the sample using a multi-reagent strip and the specific gravity and hemoglobin was determined.

RESULTS AND DISCUSSION:

The mean specific gravity value of age group 21 - 30 years is 1.015, the mean specific gravity value of age group 31 - 40 years is 1.018, the mean specific gravity value of age group 41 - 50 is 1.016, and the mean specific gravity value of age group more than 50 years is 1.020. The mean specific gravity value of females is 1.01750 and the mean specific gravity value of

males is 1.01750. The mean Hb value of females is 11.67 and the mean Hb value of males is 14.68.

CONCLUSION:

The value of mean specific gravity is slightly increased among different age groups and the mean Hb value is also slightly increased with different age groups. Between genders mean specific gravity is equal to both genders and mean Hb value is more in males compared with females.

KEYWORDS: Specific gravity, hemoglobin, blood, red blood cells, white blood cells

INTRODUCTION:

The ratio of the density of a substance to the density of the water at a specified temperature and pressure is known as specific gravity. Blood is a fluid connective tissue that delivers oxygen and nutrients to the cells and transports metabolic waste away from the cells. The specific gravity of blood at 37℃ ranges from 1.0475 - 1.0537(1). Blood contains mainly four compositions namely plasma, red blood cells, white blood cells, and platelets. The straw-colored liquid part of the blood that contains no red blood cells, white blood cells, platelets, or other cellular components is defined as plasma. It accounts for 55% of the blood. Plasma helps to maintain blood pressure and volume, supply proteins for blood clotting and immunity and helps to maintain proper pH balance in the body(2).

Red blood cells are biconcave disc-shaped cells produced from bone marrow. It contains proteins that transport oxygen from the lungs to all the parts of the body. The normal red blood cell count for the male is 4.7 - 6.1 cells per microlitre and for females is 4.2 - 5.4 cells per microlitre Average lifespan of RBC is about 120 days(3). The decrease in RBC count results in anemia. An increase in RBC count causes polycythemia. Hemoglobin is a protein molecule that helps the RBC to transport oxygen. The term heme reforms to the iron-containing porphyrin(4). This iron-containing hemoglobin is responsible for the red color of the red blood cells. Hemoglobin also helps in maintaining the shape of the red blood cells. Hemoglobin is made up of four protein molecules (globulin chains). The normal adult human hemoglobin contains two alpha-globulin chains and two beta-globulin chains. In infants, hemoglobin is made up of two alpha-globulin chains and two - gamma - globulin chains(5).

White blood cells, also known as leukocytes, are immune system cells that protect the body against infectious diseases and foreign bodies. Hematopoietic stem cells are cells that create white blood cells. (6). The normal WBC count is 4,500 - 11,000 cells per microlitre. White blood cells are of two types namely granulocytes and agranulocytes. Granulocytes contain neutrophils, eosinophils, and basophils and agranulocytes contain monocytes and lymphocytes. Neutrophils are the cells of a first-line defense mechanism(7). The decrease in WBC count causes leukopenia. An increase in WBC count causes leukocytosis.

Platelets are also known as thrombocytes, are the types of blood cells which help in blood clot during injuries. They do not have a nucleus and they are fragments of cytoplasm derived from megakaryocytes of the bone marrow(8). Normal platelets count ranges from 1,50,000 - 4,50,000 cells per microlitre. Platelets value less than 1,50,000 cells per microlitre resulting in thrombocytopenia. Platelets value more than 4,50,000 cells per microlitre resulting in thrombocytosis. The aim of the study was to analyse the specific gravity of Hemoglobin of the blood.

MATERIALS AND METHOD:

Prospective study conducted with 10 random blood samples, which were collected from the clinical lab in Saveetha Dental College. The study was approved by the Institutional ethical committee. Then the samples were analysed for blood-specific gravity and hemoglobin using a reagent strip the specific gravity and automated coulter counter method respectively. The specific gravity and hemoglobin were tabulated along with demographic details were tabulated and statistically analyzed using SPSS software version (23.0). The statistical analysis were used in this study were descriptive statistics and correlation analysis.

RESULTS AND DISCUSSION:

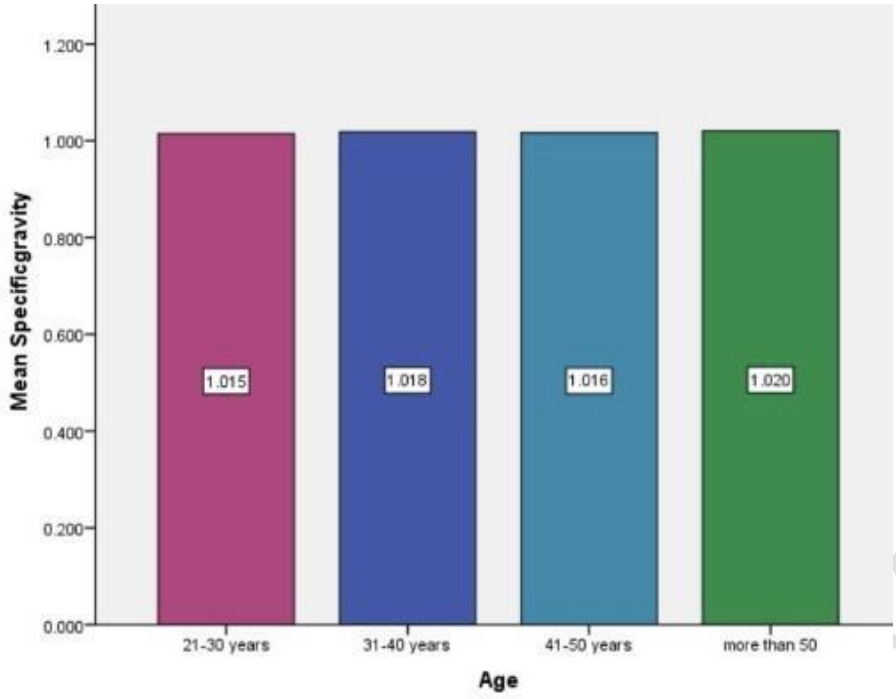

Figure 1: Bar graph representing the association between age and mean specific gravity. The X-axis represents age and Y-axis represents the mean specific gravity. Pink represents the age of 21 - 30 years showing the mean specific gravity value of 1.015. Blue represents the age of 31 - 40years showing the mean specific gravity value of 1.018. Light blue represents the age of 41 - 50 years showing the mean specific gravity value of 1.016. Green represents the age of more than 50 years showing the mean specific gravity value of 1.020.

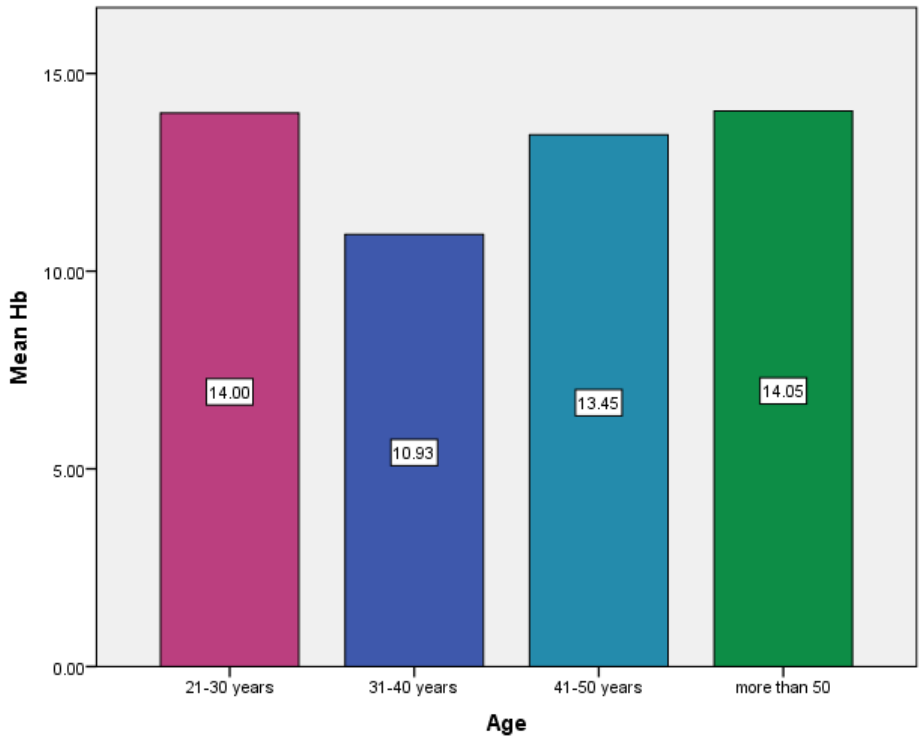

Figure 2: Bar graph showing the association between age and mean Hb. The X-axis represents age and Y-axis represents the mean Hb. Pink represents the age of 21 - 30 years showing the mean Hb value of 14.00. Blue represents the age of 31 - 40years showing the mean Hb value of 10.93. Light blue represents the age of 41 - 50 years showing the mean Hb value of 13.45. Green represents the age of more than 50 years showing the mean Hb value of 14.05.

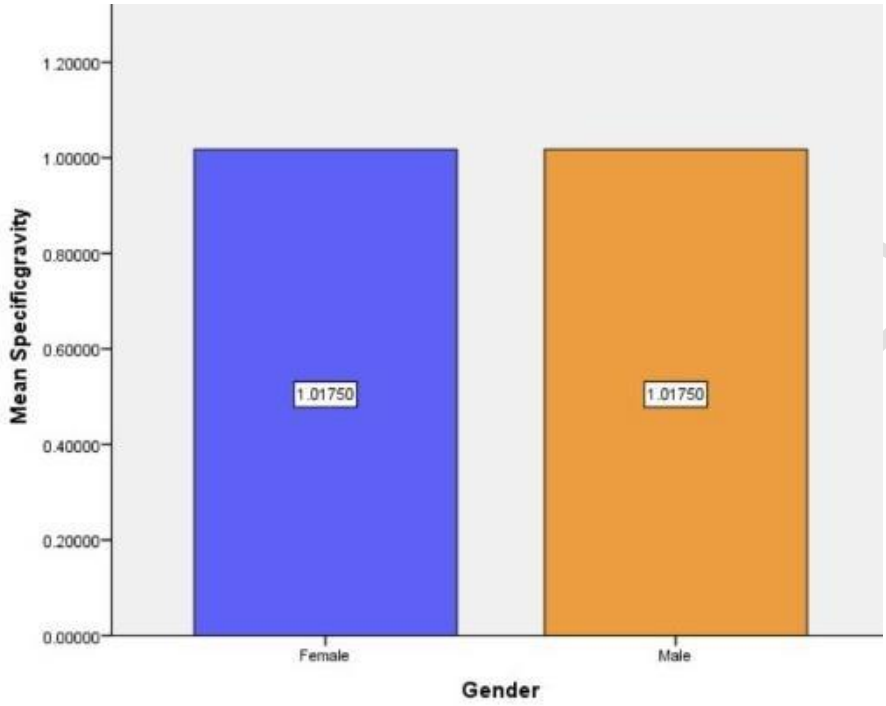

Figure 3: Bar graph showing the association between gender and mean specific gravity. The X-axis represents gender. Y-axis represents the mean specific gravity. Blue represents the female mean specific gravity value of 1.01750. Yellow represents the male mean specific gravity value of 1.01750.

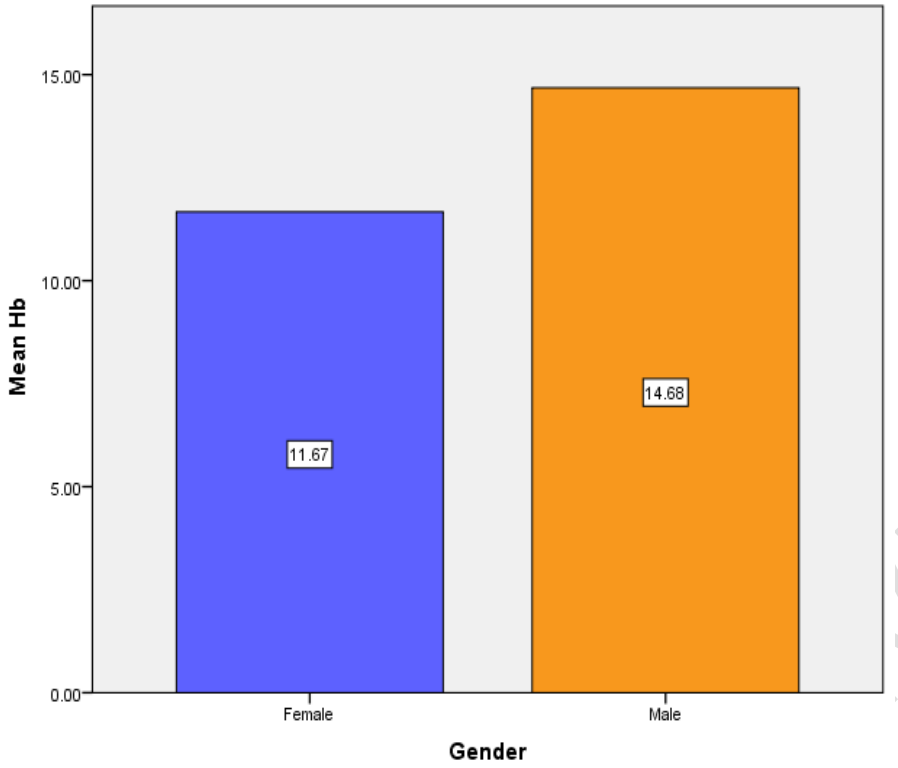

Figure 4: Bar graph showing the association between gender and mean Hb. The X-axis represents gender. Y-axis represents the mean Hb. Blue represents the female mean Hb value of 11.67. Yellow represents the male mean Hb value of 14.68.

From the samples collected 10% belong to the age group of 21 - 30 years, 40% belong to the age group of 31 - 40 years, 20% members belong to the age group of 41 - 50 years and 30% belong to the age group of more than 50 years. From the samples collected 50% of members are male and 50% of members are female. From the study the mean specific gravity value of age group 21 - 30 years is 1.015, the mean specific gravity value of age group 31 - 40 years is 1.018, the mean specific gravity value of age group 41 - 50 is 1.016, and the mean specific gravity value of age group more than 50 years is 1.020. There is an increase in mean specific gravity value corresponding to age but it is not increasing significantly. It was well correlated with the study in which the specific gravity of the population aged between 19-58 years ranges from 1.0652 - 1.0590(9).

In our study, we found that the mean Hb value of age group 21 - 30 years is 14.00g/dl, the mean Hb value of age group 31 - 40 years is 10.93g/dl, the mean Hb value of age group 41 - 50 is 13.45g/dl, and the mean Hb value of age group more than 50 years is 14.05g/dl. There is

an increase in the mean Hb value corresponding to age but it is not increasing significantly. A similar study done by Bahadur et al, showed Hb value increases significantly with the increase in age(10). From the study, the mean specific gravity value of females is 1.01750 and the mean specific gravity value of males is 1.01750. We found that the mean specific gravity value for both genders are equal. The specific gravity of males is slightly higher than females but it is not significantly high(11). From this study, the mean Hb value of females is 11.67 and the mean Hb value of males is 14.68. The mean Hb value of males is greater than the females. The Hb value is slightly higher in females than males but in some cases Hb value increases which results in rare blood diseases like polycythemia(12). Our team has extensive knowledge and research experience that has translate into high quality publications (13).(14–27) ,(28–32)

The limitations of this study considered were small sample size and not involving the systemic disorders which affect both specific gravity and hemoglobin. Further studies may be done with increased sample size, including all the systemic disorders which cause changes in specific gravity and hemoglobin.

CONCLUSION:

From this study, we conclude that the value of mean specific gravity is slightly increased with increasing age. The mean Hb value is also slightly increased with increased age. When compared between genders the mean blood specific gravity value is equal for both males and females and the mean Hb value is more in males than females.

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