COMPARATIVE CLINICOPATHOLOGICAL STUDY ON pH AND HAEMOGLOBIN OF BLOOD

Running Title: Comparison of blood pH and hemoglobin of blood.

Type of study: Original Research Article

ABSTRACT:

AIM: Aim of this study to compare the pH and hemoglobin of blood on different genders and different age groups.

INTRODUCTION: The full form of pH is the potential of hydrogen, pH is known as the negative logarithm of H+ ion concentration. The pH of any components of body, including blood, is indicated on the pH scale. The value of pH ranges from 0 to 14. A pH value of 7.0 is considered as neutral. Blood is slightly basic; the normal pH level of blood is 7.35 to 7.45. Usually, the body maintains the pH of blood close to 7.40. Hemoglobin is a protein molecule that helps the RBC to transport oxygen. The term heme reforms to the iron-containing porphyrin. This iron-containing hemoglobin is responsible for the red color of the red blood cells.

MATERIALS AND METHODS: 15 blood samples were collected from the lab in Saveetha Dental College and Hospitals. The low sample size is one of the limitations. The pH value is measured by using a multi reagent strip, hemoglobin level was measured by using an automated counter machine, and these values were plotted. The pH value was tabulated and the data were analyzed with SPSS version (23.0).

RESULTS: Mean hemoglobin value was observed different in different age group. In age groups of 21-30 years, the value was 12.95g/dl, in age groups 31-40 years the value was 12.08g/dl, in age groups of 41 to 50 years the value is 13.20g/dl and for age group more than 50 years the value is 14.05g/dl. Mean pH value on comparing with age, the value of pH was 7 for the age group of 21-30 years, 31-40 years was 7, 41 to 50 years was 7.04 and for more than 50 years was 7. Correlation analysis reveals no significant relationship between hemoglobin and pH with increasing age in both males and females.

CONCLUSION: The value of hemoglobin is increased among different age groups and the pH level remains the same and on comparing with gender the hemoglobin level increases with age group and pH remains the same.

KEYWORDS: Haemoglobin, acid base balance, blood, red blood cells

INTRODUCTION:

The dental disorder is due to the destructive imbalance in the oral cavity causing pain and loss of function. It is due to increased acidity in the mouth (1). According to research, the pH of the mouth and blood must be balanced, and proper circulation down to the cellular level is necessary for the release of cellular waste products from the body. The full form of pH is the potential of hydrogen. The negative logarithm of H+ ion concentration is known as pH. (2). The concentration of hydrogen ions in a solution is described by pH, which is an indicator of the solution's acidity or basicity.

The pH of any solution, including blood, is indicated on the pH scale. The value of pH ranges from 0 to 14. A pH of 7.0 is neutral. Blood is slightly basic; the normal pH level of blood is 7.35 to 7.45. Usually, the body maintains the pH of blood close to 7.40 (3). There are two types of abnormalities in acid-base balance are acidosis and alkalosis. In acidosis the blood has too much acid (or too little base), resulting in a decrease in blood pH. In alkalosis the blood has too much base (or too little acid), increasing blood pH (4). Acidosis and alkalosis are classified as metabolic or respiratory, depending on the fundamental causeAn imbalance in the synthesis of acids or bases and their excretion by the kidneys causes metabolic acidosis and metabolic alkalosis (5).

Respiratory acidosis and respiratory alkalosis are due to changes in carbon dioxide exhalation caused by lung or breathing disorders. The body uses different mechanisms to control the blood's acid-base balance (6). These mechanisms involve the lungs, kidneys, buffer systems. Acidic food is not only the main cause of low pH in the mouth. Xerostomia or gastroesophageal is the reflux diseases that cause an increase in acidic level in the oral cavity. After eating, bacteria in the mouth produce acids by oxidising sugar and food particles in the mouth (7). Tooth

decay occurs due to a fall in pH below 5.5. Bacterial plaques are also involved in causing dental caries (8, 9).

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 (10). The normal red blood cell count for a 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. The decrease in RBC count results in anemia. An increase in RBC count causes polycythemia (11). Hemoglobin is a protein molecule that helps the RBC to transport oxygen. The term heme reforms to the iron-containing porphyrin. 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-globin chains and two beta-globin chains. In infants, hemoglobin is made up of two alpha-globin chains and two - gamma - globulin chains (12, 13).

MATERIALS AND METHODS:

The 15 blood samples were collected from patients from the clinical lab, Saveetha Dental College, and Hospitals. The demographic details were collected from the laboratory records. And the collected samples were analyzed for hemoglobin value and pH value by using the automated colter or coulter counter method and reagent strip method respectively. The study population was selected randomly, and set with inclusion criteria of patients aged between 21-80 years and with dental complaints. The persons who were not willing to give consent, people under 20 years, unmarried were not included. The pH and Hemoglobin value and the demographic details were entered in an excel sheet and exported to SPSS version 23 and analyzed statistically for correlation analysis, Chisquare analysis, and Descriptive statistics. Finally, results were presented by using bar charts and percentage tables.

RESULTS AND DISCUSSION

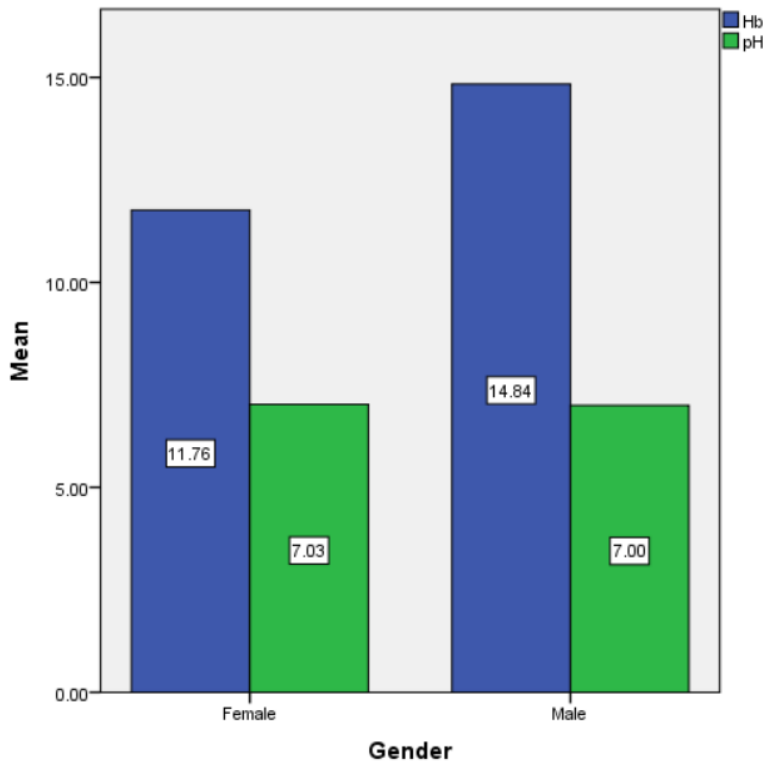

FIGURE 1: Bar graph representing the association between gender and mean hemoglobin and pH values. The X-axis represents gender and Y-axis represents the mean hemoglobin and pH values. In females blue color represents the hemoglobin level is 11.76 and green color represents pH level is 8.02. In males blue color represents the hemoglobin level is 14.84 and green color represents pH level is 7.

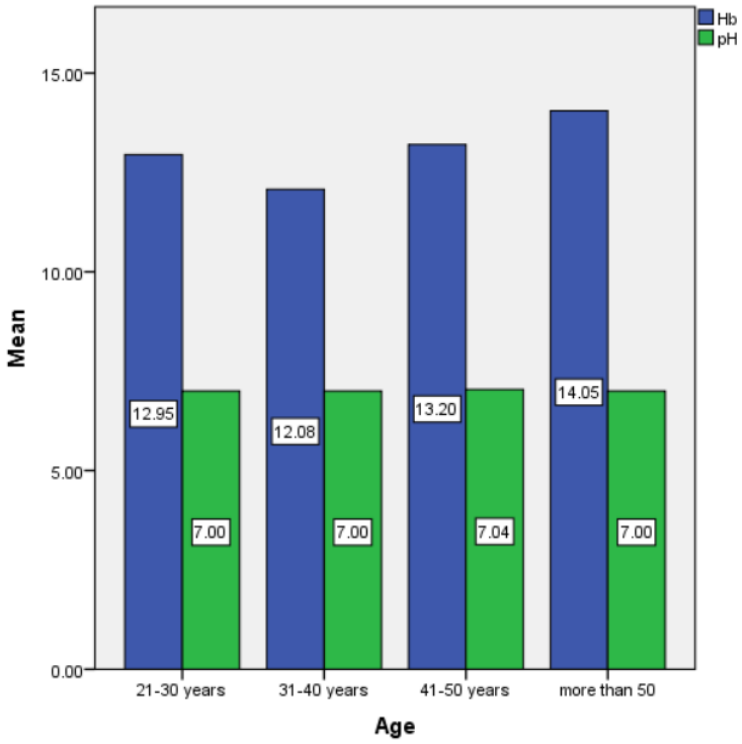

FIGURE 2: Bar graph representing the association between age with mean hemoglobin and pH level. The X-axis represents age and Y-axis represents the mean hemoglobin and pH values. Age group of 21-30 years, the level of hemoglobin was 12.95g/dl (blue) and level of pH was 7(green). Age group of 31-40 years level of hemoglobin was 12.08g/dl (blue) and level of pH was 7 (green). Age group of 41-50 years level of hemoglobin was 13.45g/dl (blue) and level of pH was 7.04 (green). Age group of more than 50 years level of hemoglobin was 14.05g/dl (blue), the level of pH was 7(green).

From the samples collected based on age two members (13%) belong to the age group of 21 to 30 years. Four members (27%) belong to the age group of 31 to 40 years. six members (40%) belong to the age group of 41 to 50. One member (7%) belongs to the age group of more than 50 years. From the samples collected based on gender eight (53%) of them were females and six (47%) were males. From the samples collected based on dental complications, seven members (46%) were affected due to caries tooth and two members (13%) were affected due to

periodontitis, and two members (13%) with denture problems, and one(7%) with trauma, and one(7%) with implant diagnosis.

In this study we have compared the mean hemoglobin value based on gender, for females, the value of hemoglobin is 11.76 g/dl and for males, the value is 14.84g/dl. The bar chart shows that males have higher hemoglobin levels than females. Men and women have distinctmean hemoglobin levels in health in venous blood -women have mean levels about12% lower than men (14). When compared to the mean pH value based on gender, for females, the value of pH is 7.03 and for males, the value is 7. As shown in Figure 1, the females have higher pH than males. Numerous studies have generally revealed the existence of variances in skin surface pH based on gender, age, and ethnicity, but the results have varied depending on anatomical regions, measuring methods, and measurement time. In general, female sex, younger age, and black skin have a lower skin pH than male sex, older age, and white skin. (15)

In this study we have compared the mean hemoglobin value between different age groups, 21-30 years the value is 12.95g/dl and between 31-40 years the value is 12.08g/dl and between 41 to 50 years the value is 13.20g/dl and for age group more than 50 years the value is 14.05g/dl. Figure 2 shows that the hemoglobin level is increasing along with age but the mode of increasing is not significant. The correlation analysis showed that there is no significant relationship between age and hemoglobin after 20 years in both males and females. When compared to children and adults there is a significant relation identified and proved in the previous study that the younger population has a higher hemoglobin level than the older population. (16, 17)

In this study we have compared the mean pH value on comparing with age, the value of pH is 7 for the age group of 21-30 years and the value for 31-40 years is 7 and the value for 41 to 50 years is 7.04 and the value for age more than 50 years is 7. Figure 2 shows that there is no significant increase in pH with an increase in age. According to another article, the older adultsare more prone to grow acid-base disturbances than young, with age, the kidney undergoes structural and functional changes that restrictthe adaptive mechanisms responsible for maintaining acid-base homeostasis in response to dietary and environmental changes (18). Our

team has a wealth of research and knowledge that has resulted in high-quality publications (19). (20–33) The limitations of this study were, not considering the sample size, association with other systemic illness which affects the pH and Hemoglobin. Further studies can be done with more sample size and considering the systemic disorders in the future.

CONCLUSION:

From this article we conclude that in comparison with gender, males have a higher hemoglobin level when compared to females and pH is almost the same and on comparison with age. The hemoglobin level is slightly higher in the older population than in young adults and the pH level remains the same for all age groups.

Ethical Approval:

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

Consent

As per international standard or university standard, patients' written consent has been collected and preserved by the author(s).

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