

Original Research



Comparative study of the Increasing Hemoglobin Levels Effects on Blood Pressure among Adult men in Al-Hashimya District, Babylon Province, Iraq

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Abstract:

The aim of the current study was to compare whether higher levels of hemoglobin (Hgb) associate with increasing blood pressure.

Methods:

The study was composed of 200 men aged 25 to 60, who often went to Al-hashimya general hospital in the Iraqi province of Babylon's Al-Hashimya district. The participants were divided into two groups; the first group (G1) consisted of 100 people with normal Hgb levels (for men, the range is 38.3% to 48.6%), while the second group (G2) consisted of 100 participants with Hgb levels higher than 48.6%. Hemoglobin level, blood pressure and Body mass index were measured.

Result:

Hemoglobin level appeared positive correlation with the systolic and diastolic blood pressures.

Conclusion: This study has been proposed that a higher hemoglobin level elevates blood pressure. There was a positive relationship between healthy individuals' hemoglobin levels, systolic blood pressure, and diastolic blood pressure.

Keywords: Blood Pressure, Hemoglobin Levels, Adult men, Iraq

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Introduction:

Hypertension is defined as systolic blood pressure (SBP) values of 130 mm Hg or more and the diastolic blood pressure (DBP) of more than 80 mm Hg. Hypertension is considered the most common chronic medical condition characterized by a persistent elevation in arterial pressure [6].

Over the past few decades, there has been an increase in the hypertension prevalence worldwide, particularly in the low- and middle-income countries. High blood pressure is a widespread issue causing cardiovascular disease and organ damage (brain, eyes, heart, kidneys, and

blood arteries) by the existence of structural or functional alterations in the end organ system [3,4,5].

The mature red blood cell has an 8 m diameter and a 120-day life span. Due to its remarkable flexibility, it can squeeze through microcirculation tubes with a 3.5 m minimum diameter. A protein found in red blood cells called hemoglobin makes it easier to carry carbon dioxide and oxygen. Each red blood cell contains about 640 million molecules of hemoglobin. Four polypeptide chains—two α and two β chains—make up hemoglobin. Each of these strands has a heme prosthetic group attached to it.[10]. Levels of Hgb are influenced by genetics and the environment, and they differ based on gender, race, age, and altitude of residence [7,8].

Higher (Hgb) levels linked with an adverse metabolic profile, a rise in the incidence of important metabolic syndrome symptoms, and an increased risk of cardiovascular disease and total mortality [9].

Several studies[11,12,13,14,15] have shown that increased hemoglobin levels correlate with increasing blood pressure. Atsma et al.,(2012) found that systolic blood pressure and diastolic blood pressure are both correlated positively with hemoglobin level. Shimizu et al.,(2014) found in both non-anemic Japanese men and women there was an independent positive association between hemoglobin levels and the risk of hypertension. Son et al., (2020) study exposed there was association between hemoglobin levels and incidence of hypertension in a Korean people over 40 years and proposed that the greater hemoglobin variability is correlated with the increased incidence of hypertension. Ghosh et al.,(2021) established that Hgb level correlates positively with SBP and mean arterial pressure only in older persons without obvious comorbidities. Liu et al.,(2022) study identified that erythrocytes and hemoglobin were correlated with an increased risk of hypertension in women.

This study was conducted to compare the relationship between higher hemoglobin levels and increasing blood pressure in higher hemoglobin levels group and normal hemoglobin level group among adult men in Al-Hashimya District, Babylon Province, Iraq.

Methods:

Study Design:

The study included 200 men accepted to participate in this study aged 25-60 years who visited Al-hashimya general hospital in the Iraqi province of Babylon's Al-Hashimya District. The participants dividing into two groups according to Hgb levels ; the first group (G1) comprise from 100 participants has normal Hgb levels (the range for males, it is 38.3% to 48.6%)the second group (G2) comprise from 100 participants who has Hgb levels more than 48.6%. An interview was conducted using a structured questionnaire used to collect information regarding comorbidities and age; People with chronic diseases and with Hgb levels less than normal level value were excluded.

Packed cell volume of the participants was estimated by filled the capillary tube with blood (2/3 or 3/4). The other end of capillary tube sealed with plastic sealant then Placed these tubes in a centrifuge at 12000 g for five minutes. After that the reading were recorded using micro hematocrit reader.

The hemoglobin levels was also calculated as 1/3rd of Packed Cell Volume (PCV) levels according to human medical practice for healthy human populations. The measurement of the packed cell volume (PCV), or else known as the hematocrit, is so beneficial in any hematologic examination that its existence in hematology test[16] .

The systolic and diastolic blood pressure (BP) of the participants was measured by a riester mercury sphygmomanometer and appropriately sized cuff according to the recommendations of American College of Cardiology/American heart Association (ACC/AHA). Participants should be

relaxed and seated with uncrossed legs and back and arm supported. If possible, the patient should be seated at least five minutes before pressure reading. Blood pressure was measured two times with a one-minute interval between them. Blood pressure readings are expressed in millimeters of mercury (mm Hg). [1,2].

Body mass index (BMI) for both group was measured as follows: $BMI (kg/m^2) = \text{weight (kg)} / (\text{height (m)})^2$.

Statistical analysis

Statistical Package for Social Science (SPSS) version 23.0 (SPSS, Chicago, USA) was used for statistical analysis of the data. Data was given in the form of Results are presented as mean \pm SD (standard deviation). The independent t-test analyses were conducted to assess the differences in hemoglobin concentrations and blood pressure between groups. All (p values) were 2-tailed, with statistical significance defined by ($P \leq 0.01$).

Results:

The results of table (1) displays some selected characteristics of participants as mean \pm SD. The Pcv% in group 1 was (43.14 ± 2.94) and in group 2 was (51.23 ± 5.85) and there was significant differences at ($P \leq 0.01$) between two groups. Hemoglobin levels was also calculated as 1/3rd of Packed Cell Volume and was (14.38) in group G 1 and (17.07) in group G 2.

Systolic blood pressure was (119.96 ± 17.17) mm Hg in group G1 and (131.43 ± 20.55) in group G2 and there was significant differences at ($P \leq 0.01$) between two groups.

Diastolic blood pressure in group G1 was (119.96 ± 17.17) mm Hg and in group G2 was (89.47 ± 15.05) mm Hg and there was significant differences at ($P \leq 0.01$) between two groups.

The results of body mass index as show in table (1) exposed the mean \pm standard deviation of group G1 (25.31 ± 5.39) and (26.56 ± 7.21) for group G2 and non-significant differences between two groups.

Table (1) Differences between the characteristics of the study participants.

Characteristics	Group 1	Group 2	P-value
PCV %	43.14 ± 2.94	51.23 ± 5.85	0.00*
Hgb level	14.38	17.07	0.00*
SBP(mm Hg)	119.96 ± 17.17	131.43 ± 20.55	0.003*
DBP (mm Hg)	76.83 ± 6.97	89.47 ± 15.05	0.00*
Body mass index (kg/m ²)	25.31 ± 5.39	26.56 ± 7.21	0.15

N=100 for each group, values are expressed as mean \pm standard Deviation. *refer to significant difference between groups. PCV Packed Cell Volume, Hgb hemoglobin, SBP systolic blood pressure, DBP diastolic blood pressure.

The results of correlation between packed cell volume and blood pressure as show in figure (1,2)

clarified that there was a positive correlation and a linear increase between BP and pcv levels.

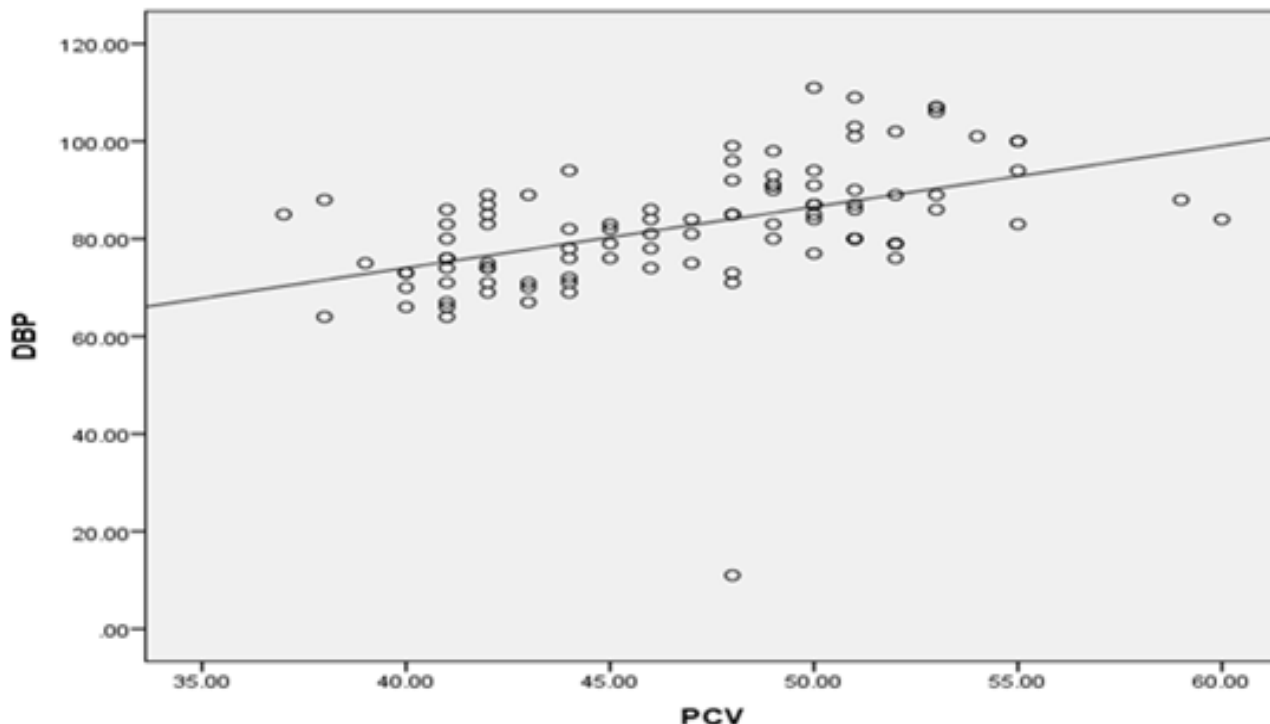


Figure (1) Correlation between packed cell volume and diastolic blood pressure.

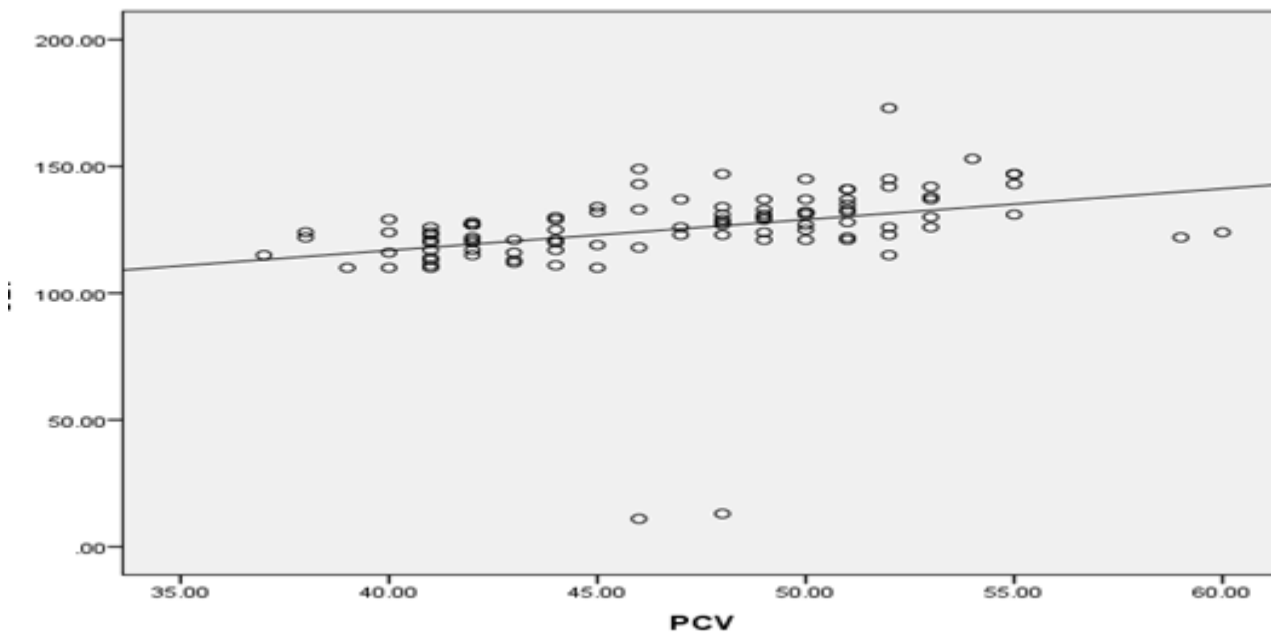


Figure (2) Correlation between packed cell volume and systolic blood pressure.

Discussion:

The current study investigate that when packed cell volume increase the blood pressure also increase which appears the positive correlation between Hgb level and SBP and DBP, this study

considered the first study that compare the relationship between higher hemoglobin levels and increasing blood pressure group among healthy adult men in Al-Hashimya District,

Babylon Province, Iraq according to normal level value of packed cell volume and above normal level value.

The results of packed cell volume revealed high levels in group G2, High hemoglobin levels could be an indication of the rare blood disorder as polycythemia. In polycythemia, the body produces anaexcessive amount of red blood cells, which makes the Patient bloods thicker than normal. Clots, heart attacks, and strokes may result from highing levels of Hgb. Many causing may result in high hemoglobin levels as dehydration, smoking, or living at a high altitude. High hemoglobin levels might also be an indication of other illnesses, like heart or lung problems.[17,18]

The results of blood pressure reveals that when packed cell volume inceasing the SBP and DBP increasing this result confirm with [19] that found hypertension, are brought on by increasing PCV and BMI.

The results of present study exposed the correlation between PCV and SBP and DBP in males showed a positive correlation. In this detail, the results of several previous studies [11,12,13,14,15] and [20] showed that when hemoglobin levels increased, the systolic and diastolic blood pressure will be increased. The significant correlation between BP and PCV maybe because inceasing of PCV causes high blood viscosity which affects vascular resistance and is thought that it impacts blood pressure[21] or because alterations in vascular resistance and vasoconstriction [22], also [23] both physical and mental stressors are accompanied by increases in hematocrit and hemoglobin.

Conclusion:

The results of the current study showed that a higher hemoglobin level causing elevates blood pressure. There was also a positive association between healthy individuals hemoglobin levels, systolic blood pressure, and diastolic blood pressure.

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