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The Status of Plasma Homocysteine in Healthy-Looking Elderly Men and Its Link to Postprandial Glucose Level

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Abstract

Objective: The study aimed to examine the plasma homocysteine levels in a population of non-diabetic elderly individuals and investigate their potential association with postprandial glucose levels. **Materials and methods:** A sample of 70 volunteer elderly retired men, aged 63–79, who attend outpatient clinics after a clinical examination, is sent to the laboratory technician for a homocysteine test and a postprandial glucose test. After obtaining results, the data were entered and then analyzed using the SPSS program (Version 21) to summarize the results into graphics and tables. The t-test was used to analyze these data, where 0.05 was the minimum significance level. **Results:** The results of the study showed that 60% of healthy elderly people showed a rise in the level of plasma homocysteine, particularly among those over 70 years old. Also, the mean level of fasting glucose (10.93 mmol/l) was higher in non-diabetic elderly people who were affected by hyperhomocysteinemia. In conclusion, hyperhomocysteinemia, a condition affecting older individuals, is physiologically linked to increased plasma glucose levels, particularly in those over 70 years old.

Keywords: Hyperhomocysteinemia, non-diabetic elderly people, retired population, postprandial glucose, outpatient clinics.

INTRODUCTION

Homocysteine is an essential amino acid called homocysteine is made in the blood by adding a methyl group from vitamin B-6 or folic acid to methionine that has been ingested [1]. It is worth noting that homocysteine levels tend to be greater in males compared to females and increase with age. The prevalence of this condition tends to rise with advancing age, primarily affecting the senior population, notably males [1–3]. Numerous studies have demonstrated a significant correlation between serum homocysteine levels and the susceptibility to various diseases and health conditions, including ischemic heart disease [4], pulmonary embolism [5], deep vein thrombosis [6], stroke [7], Alzheimer's disease [8], dementia [9], cognitive impairment [10], depression in older adults [11], and osteoporosis [12]. Since everyone ages, institutions and organizations need to encourage a healthy, active aging process. This lessens the strain on healthcare systems and allows people to continue contributing to society while improving their general well-being [13]. Multiple factors, including genetic, environmental, and nutritional factors, have been

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identified as determinants of sugar content [14]. Research has indicated that inadequacies in vitamin B6, folic acid, vitamin B12, and riboflavin are dietary factors that contribute to an elevated concentration of this particular amino acid inside the human body [12]. The concentration of homocysteine tends to increase in individuals who have a preference for consuming a high quantity of protein-rich foods, particularly meat, while simultaneously consuming a limited amount of leafy vegetables and fruits. These plant-based foods are known to supply the body with essential B vitamins and folic acid, which aid in the metabolism and elimination of homocysteine [15]. Using a mix of vitamin B, B12, and folic acid is the best way to prevent homocysteine buildup because it helps turn homocysteine into non-toxic compounds [16]. Individuals who have Hyperhomocysteinemia can experience damage to epithelial cells, which is a key part of blood cell inflammation, oxidative stress, and the release of cytokines [17]. The objective of this study is to examine the plasma homocysteine levels in a population of non-diabetic and non-cardiac elderly individuals with cardiac conditions and investigate their potential association with postprandial glucose levels.

MATERIALS AND METHODS

This study involves a cohort of 70 healthy-looking elderly retired men (non-diabetic and non-cardiac) with normal BMI (25–27 kg/m2), ranging in age from 63 to 79 years. All members of the study sample underwent some routine physical examinations in outpatient clinics. After conducting these tests, it was determined that they did not have diabetes or heart problems by the specialist doctor, and after the doctor discussed the subject and purpose of the study, they were referred to a laboratory technician for a homocysteine test and a postprandial glucose test (making sure they ate lunch) along with other necessary blood tests as determined by the doctor. The costs of laboratory tests (homocysteine testing and post-meal glucose test) were covered by the researchers.

Blood tests

Homocysteine in blood plasma was analyzed by extracting approximately 2 ml of blood from each sample and transferring it to another test tube containing anticoagulants (EDTA). After that, the sample was immediately placed in a special container filled with ice and then centrifuged for 30 minutes. This is a precaution to prevent any possible errors in detecting homocysteine levels caused by the secretion of red blood cells. Once the plasma is obtained, it will undergo a cooling process and later be kept at -80°C until the analysis is fully performed. The high-performance liquid chromatography (HPLC) method has been adopted to measure the total level of homocysteine in plasma in the laboratory. The normal range for plasma homocysteine is typically between 5.9 and 11.4 μm/L. Deviations from this range are regarded as abnormal in males aged 60 and above [2, 18]. Postprandial glucose levels in the bloodstream were measured using the glucose oxidase method.

Statistical analysis

Following the completion of the necessary tests for the study, the obtained data were input into the statistical software SPSS (Version 21) in order to condense the results into visual representations and statistical tables. The statistical analysis employed the t-test to examine the data, with a minimal significance level of 0.05.

RESULTS

According to the findings presented in Figure 1, there is a marginal difference in the proportions of men aged 63–69 (51.4%) and men aged 70–79 (48.6%).

According to the information in Figure 2, most of the older men who took part in the study had significantly higher plasma homocysteine levels, which is known as Hyperhomocysteinemia and is about a 60% increase. Conversely, a more 7.1% of

the participants demonstrated a decrease in homocysteine levels, known as Hypohomocysteinemia. The other individuals displayed homocysteine levels within the normal range, accounting for approximately 32.9% of the sample.

The study presents data in Table 1, indicating that the average ages of elderly men affected by Hypohomocysteinemia and Hyperhomocysteinemia are 70.40 years and 71.90 years, respectively. Conversely, the mean age of individuals with normal levels of homocysteine is much lower at 66.30 years. The study found that the average fasting glucose levels in elderly individuals with normal plasma homocysteine levels were within the accepted range (5.64 mmol/l). In contrast, older people whose plasma homocysteine levels were higher also had higher average fasting glucose levels (10.93 mmol/l), as shown in Table 2.

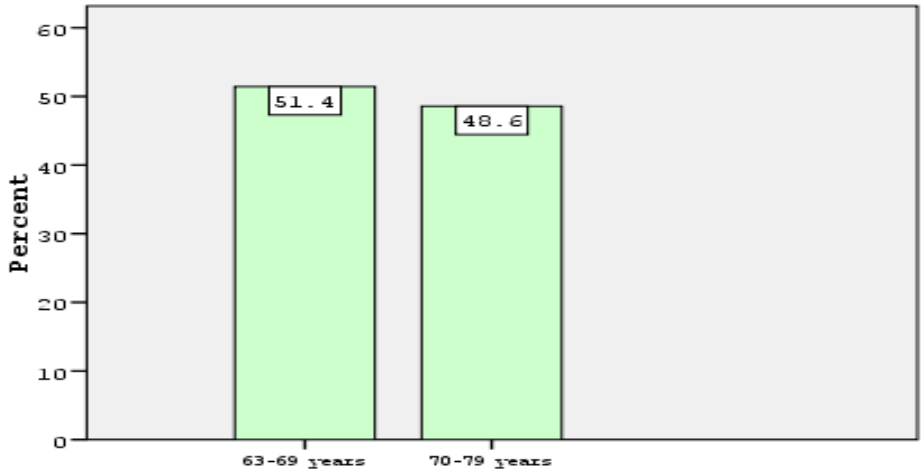

Figure (1): Distribution of the study sample based on age groups

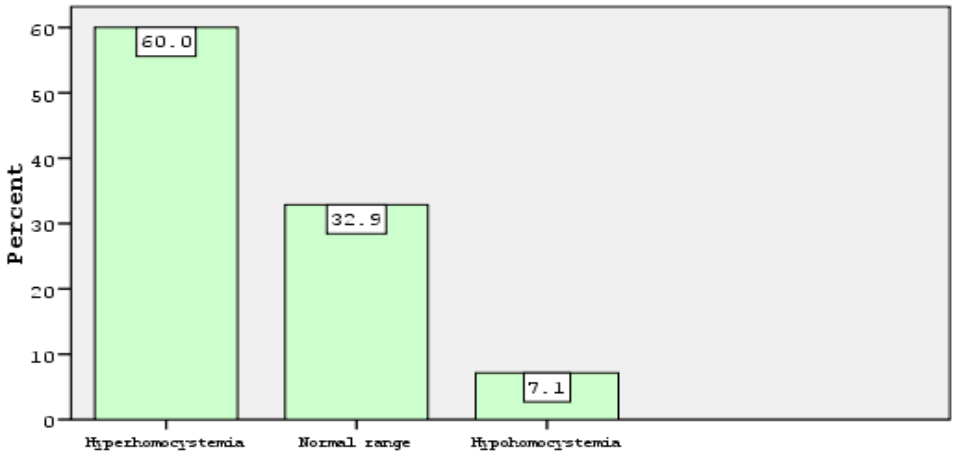

Figure (2): Distribution of the study sample based on serum Homocysteine levels

Table (1): The correlation between plasma Homocysteine levels and the mean age

Plasma Homocysteine Levels	No.	Mean±SD/years	Statistics
Normal (5.9-11.4 µmol/L)	23	66.30±3.36*	t-test= 8.170
Hypohomocysteinemia (< 5.9 µmol/L)	5	70.40±5.81	p-value= .001
Hyperhomocysteinemia (>11.4 µmol/L)	42	71.90±6.11	

* Significant (p< 0.05), SD=Standard deviation

Table (2)*:* The correlation between plasma Homocysteine levels and the mean glucose level

Plasma Homocysteine Levels	No.	Mean±SD/years	Statistics
Normal (5.9-11.4 µmol/L)	23	5.64±0.94*	t-test= 14.355
Hypohomocysteinemia (< 5.9 µmol/L)	5	6.06±0.60	p-value= .000
Hyperhomocysteinemia (>11.4 µmol/L)	42	10.93±5.04	

* Significant (p< 0.05), SD=Standard deviation

DISCUSSION

Homocysteine serves as a significant indicator for assessing an individual's overall health status [19,20]. The impact of Hyperhomocysteinemia on older men was shown to be statistically significant in the current investigation. In contrast, a separate study done in Buenos Aires, Argentina, focusing on a specific population of older individuals, observed a similar influence of elevated blood homocysteine levels on older men [2]. Several researchers have shown that a variety of factors, including aging, vitamin B12 absorption alteration, metabolic interventions, and disorders in renal excretion mechanisms, can contribute to high homocysteine levels [2]. This rise can be potentially attributed to the suboptimal dietary patterns among older Iraqi agers, due to the excessive consumption of many refined grains as the primary source of daily sustenance.

According to a Chinese study, a diet with high amounts of refined grains is associated with elevated levels of homocysteine [21]. According to a Chinese study, a diet with high amounts of refined grains is associated with elevated levels of homocysteine [22].

Our study revealed a significant association between high homocysteine levels at an average age of 71.90 years, and this is consistent with another separate study conducted in China, with an average age of 71.27 years [23]. This may be caused by the presence of malondialdehyde (MDA), oxidized protein damage, or DNA damage in healthy older men, who would develop Hyperhomocysteinemia. Furthermore, several research papers have suggested that these indicators may be attributed to age-related physiological changes or increased body fat. [24]. It has also been observed in many research studies that older men have less folic acid physiologically, as its decrease effectively reduces homocysteine levels in healthy people [25].

Also, it has been seen that older adults who are healthy and have high levels of folic acid do not have high levels of homocysteine. Homocysteine is linked to changes in oxidative stress and the ability of blood vessels to widen in response to endothelium-dependent stimuli [26]. The McKinley et al. study acknowledged that elderly individuals are susceptible to vitamin deficiencies as they age [25]. In this study, it was observed that supplementing healthy individuals between the ages of 63 and 80

with a daily dose of 1.6 mg of vitamin B6 for a duration of 12 weeks following folic acid supplementation resulted in a significant 7.5% reduction in homocysteine levels. In addition, this study revealed an association between elevated homocysteine levels and increased fasting blood sugar among the elderly despite no history of diabetes. A definitive relationship between insulin resistance and homocysteine levels in individuals without underlying health conditions remains a subject of contention, with conflicting evidence presented [27]. A study conducted in London, involving a sample of 100 healthy men that examined various biomarkers, including homocysteine levels, insulin resistance, and other tests associated with glucose levels, indicated a statistically significant relationship between total homocysteine and elevated glucose levels [27].

CONCLUSION

In conclusion, homocysteine not only rises in the presence of a specific medical problem, but can also rise with age, especially among those over the age of seventy. Moreover, homocysteine is associated with increased blood glucose levels after eating. This study hypothesizes that lower levels of vitamin B6 and folic acid with age in healthy-looking people raise homocysteine levels.

Ethical Approval:

The Medical Ethics Committee of Middle Technical University approved this study with reference number MEC: 10.

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