

The basics of Homocysteine:

- Byproduct of protein metabolism• Metabolized/detoxified in the liver
- Risk factor for cardiovascular disease• Necessary nutrients include B-12, folate, B-6, di or trimethylglycine
- Normal values Homocysteine in human body:
- Male: 6.3-15.0 $\mu\text{mol/L}$ • female: 4.6-12.4 $\mu\text{mol/L}$
- Comment – optimal levels are generally considered to be $< 9 \mu\text{mol/L}$ with some calling for $< 7 \mu\text{mol/L}$.
- Hyperhomocysteinemia can be categorized clinically as:
- Moderate: upper limit of normal to 30 $\mu\text{mol/L}$ • Intermediate: $>30-100 \mu\text{mol/L}$
- Severe: $>100 \mu\text{mol/L}$ (17,18,19).

The aim of this study

Is assessing the Plasma homocysteine level in Alzheimer’s disease , and comparing it with a control group, and also determining the relationship of homocysteine level with biochemical markers as Folic acid and Hb.

2. Materials and Methods

Eighty patient and 50 control healthy human categories for two groups depended to period age (60-74)year and (75-93)yearForty patients with Alzheimer’s disease and 25 healthy people.As were studied in Alshamaeahhospital-Baghdad , Iraq, from May2013 to April 2015.This study was performed with patients consent and approved by the Ethics Committee all patients and control samples carried out in College of Medicine Al-Nahran UniversityLaboratories. The diagnosis of Alzheimer’s disease was based on the diagnostic criteria of American Psychological Association(20).

Blood collection and assessment of biomarkers: Measurements of plasma tHcy, folate, vitamin B12 have been described previously (21). In brief, tHcy was determined by HPLC; by used UV detector at 338nm assay; and folate and B12 were measured by an ultrasensitive ELISA assay (R&D Systems, Minneapolis, MN), with CVs of 10.3%, 6.1%, and 4.1%, respectively (22).

3. Results

The mean age in group 1 patients was 72.1 ± 7.9 and control group 1 was 70.8 ± 7.7 . There were males and females in the case and control groups. Both groups were equal regarding age and gender, and similar risk factors(Table 1).The number of patients according to global deterioration scale is shown in Figure 1. The average level of plasma homocysteine in patients was $24.01 \pm 9.21 \mu\text{mol/l}$,and in the control group 1 was $10.31 \pm 4.25 \mu\text{mol/lit}$. The difference of plasma homocysteine level in patients and control group was significant ($p=0.001$). The average plasma homocysteine level of patients group 2 was $27.34 \pm 10.52 \mu\text{mol/lit}$ in the control group 2 was $10.36 \pm 4.01 \mu\text{mol/lit}$ The difference of plasma homocysteine level in patients and control group 2 was significant ($p=0.438$).There was a significant For estimating the homocysteine cut point. The average level of serum Folicacid in patients was $6.58 \pm 2.00 \text{ ng/ml}$,and in the control group 1 was $8.87 \pm 3.88 \text{ ng/ml}$. The difference of

serum Folic acid level in patients and control group 1was significant ($p=0.39$). The average serum Folic acid level of patients group 2 was $7.03 \pm 2,96 \text{ ng/ml}$ in the control group 2 was $10.91 \pm 4.55 \text{ ng/ml}$ The difference of plasma homocysteine level in patients and control group 2 was significant ($p=0.511$).There was a significant For estimating the Folic acid.The average level of serum B12 in patients was $200 \pm 69 \text{ pmol/l}$,and in the control group 1 was $236 \pm 76 \text{ pmol/l}$. The difference of serumB12 level in patients and control group1 was nosignificant ($p=0.11$). The average serum B12 level of patients group 2 was $7.0 \pm 2.96 \text{ pmol/l}$ in the control group 2 was $10.36 \pm 4.01 \text{ pmol/l}$ The difference of serum B12 level in patients and control group 2 was significant ($p=0.094$).There was a significant For estimating the B12.All results showed in Table 1, Fig 2 and Table 2, Fig 3

Table 1: Comparison of all measured parameters between control andAlzheimer’s Patient group1(Data presented as Mean \pm SD).Based on age(60-74)year.

| Parameters | Controls Mean \pm SD N=25 | Patient Mean \pm SD N=40 | P value |
|--------------------------------|-----------------------------|----------------------------|---------|
| Homocystiene $\mu\text{mol/L}$ | 10.31 \pm 4.25 | 24.01 \pm 9.21 | 0.001 |
| Folic acid ng/ml | 8.87 \pm 3.88 | 6.58 \pm 2.00 | 0.39 |
| B12 pmol/L | 236 \pm 76 | 200 \pm 69 | 0.11 |

Table 2: Comparison of all measured parameters between control and Alzheimer’s Patient group 1(Data presented as Mean \pm SD).Based on age (75-93)year.

| Parameters | Controls Mean \pm SD N=25 | Patient Mean \pm SD N=40 | P value |
|--------------------------------|-----------------------------|----------------------------|---------|
| Homocystiene $\mu\text{mol/L}$ | 10.36 \pm 4.01 | 27.34 \pm 10.52 | 0.438 |
| Folic acid ng/ml | 10.91 \pm 4.55 | 7.03 \pm 2.96 | 0.511 |
| B12 pmol/L | 206 \pm 58 | 189 \pm 49 | 0.094 |

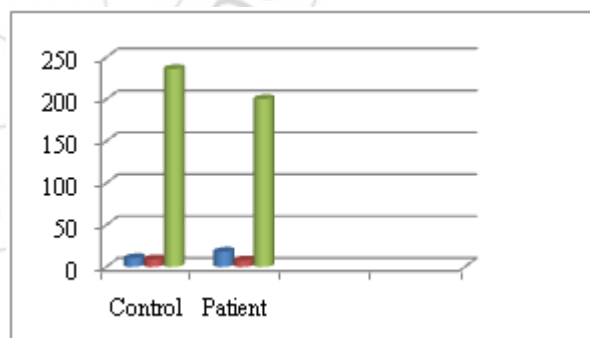


Figure 2: parameters in control and Alzheimer’s Patient group1

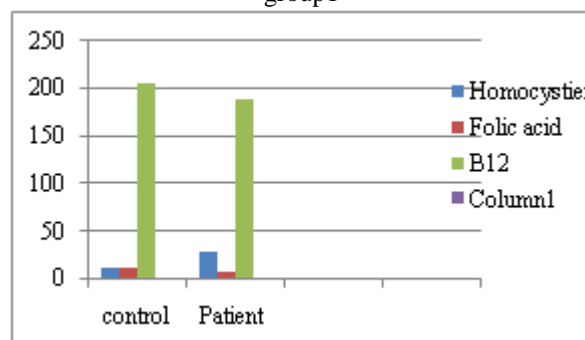


Figure 3: Parameters in control and Alzheimer’s Patient group2

4. Discussion

Any interference for decreasing the risk of disease or to delay the beginning of the disease, has a very important influence on the costs of health care. One factor that has a supportive role for Alzheimer disease is nutrition. In this area, the relationship of the serum concentration of vitamins B12, folic acid, and homocysteine with Alzheimer disease has been shown in various studies.¹⁰ In a study carried out by Seshadri (23) 1092 non-dementia persons (667 females and 425 males with an average age of 65) were followed for 8 years, and 111 individuals were affected ultimately by dementia, with 85 having Alzheimer disease. They concluded that with a plasma homocysteine level higher than 14 mmol/l, the risk of Alzheimer disease would be approximately 2 times higher. Therefore, homocysteine was considered as a strong and independent risk factor for dementia, and Alzheimer disease. Ravaglia et al (24) concluded in their study that higher concentration of total plasma homocysteine, and lower concentration of serum folate are independent predicting factors for developing dementia and Alzheimer disease. It was shown by Gallucci et al's (25) study, that serum homocysteine level had a distinct increase in Alzheimer disease in comparison with the control group. Selley (26) also showed that plasma homocysteine level in Alzheimer's patients had a distinct increase in comparison with the control group. Against that, there is a considerable decrease in plasma adenosine concentration in Alzheimer's. This is in disagreement with other studies,^{8,11,12} which did not find a relationship between homocysteine level and Alzheimer disease. In summary, most studies showed that hyperhomocysteinemia is a risk factor for Alzheimer disease in agreement with ours. The probable mechanisms of effect of homocysteine in Alzheimer's include the cytotoxic effect, which results in damage of vascular endothelium, and accelerate the process of thrombosis, prevention of nitric acid function, which is a vasodilator, and decreasing of adenosine level.

In conclusion, this study showed that the serum homocysteine level in Alzheimer disease (AD) was significantly higher in comparison with the control group, however, there is no relationship between plasma homocysteine level and Folic acid and B12. We suggest that this study should be carried out on a large number of blood samples taken from AD patients, especially with severe disease.

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