Journal of Recent Advances in Medicine

Print ISSN: 2636-252X
Online ISSN: 2636-2538

Original Article

Clinical utility of serum brain-derived neurotrophic factor levels and its gene polymorphism Val66Met in diabetic retinopathy patients with type 2 diabetes mellitus

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ABSTRACT

Background: Diabetes mellitus (DM) is a heterogeneous metabolic disorder characterized by the presence of hyperglycemia due to impairment of insulin secretion, defective insulin action or both. Diabetic retinopathy (DR) is a vision threatening neurovascular disease and the most dangerous complication of DM. Brain-Derived Neurotrophic Factor (BDNF) is an important protein for the neurons survival. It is produced in the retina by retinal ganglion cells (RGCs) and encoded by BDNF gene.

Objective: to clarify the association of serum BDNF levels and its gene polymorphism Val66Met (rs6265) with the development of diabetic retinopathy in type 2 diabetic patients.

Methodology: This case-control study was conducted on was conducted on 60 diabetic patients (30 of them having diabetic retinopathy, while the other without retinopathy), In addition to 30 healthy subjects as controls. Serum BDNF was detected by Enzyme-linked immunosorbent assay (ELISA) and BDNF Val66Met polymorphism genotyping was performed by real time PCR.

Results: No statistically significant difference between DR patients, diabetic without retinopathy patients, and healthy control subjects regarding BDNF genotypes frequency distribution ($p > 0.05$), and/or serum BDNF levels ($p > 0.05$).

Conclusions: This study demonstrated that, neither BDNF Val66Met polymorphism nor serum BDNF levels were associated with development of DR.

JRAM 2021; 2(1): 72-79

Key words: Brain-derived neurotrophic factor, BDNF gene Val66Met polymorphism, diabetic retinopathy.

Submission Date: 24 July 2020 **Acceptance date:** 2 September 2020

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Please cite this article as: Darweesh AM, Elkishki MM, Abdel Rassoul MR, Akl NS, Mohammed EE. Clinical utility of serum brain-derived neurotrophic factor levels and its gene polymorphism Val66Met in diabetic retinopathy patients with Type 2 diabetes mellitus. JRAM 2021; 2 (1): 72-79. DOI: 10.21608/jram.2020.37034.1077

INTRODUCTION

Diabetes mellitus is a heterogeneous metabolic disorder characterized by the presence of hyperglycemia due to impairment of insulin secretion, defective insulin action or both. Chronic hyperglycemia exposes diabetic patients to harmful complications [1]. Diabetic retinopathy is the most prevalent neurovascular complication of DM. Oxygen and nutrients are carried to the retinal cells by the nearby vessels which are destroyed by the inflammatory effect of hyperglycemia. The destroyed vessels begin to leak which makes the retina swollen and hypoxic. The retina reacts to this deterioration by secretion of growth substances e.g. vascular endothelial growth factor (VEGF) that forms new vessels. These new-formed vessels are very fragile; it easily bleeds and may be blocked with subsequent worsening of the ischemia. DR is classified into; non-proliferative diabetic retinopathy (NPDR), proliferative diabetic retinopathy (PDR), and diabetic macular edema (DME). NPDR shows microaneurysms and hemorrhages. PDR is a more advanced stage, where there are vascular occlusion and neovascularization. DME represents a major threat to vision due to blood retinal barrier (BRB) damage and

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fluid accumulation inside neural tissues, which may end in blindness [2]. The prevalence of diabetic retinopathy is 34.6% (93 million worldwide). Diabetic retinopathy accounted for about 42% of diabetic patients in Egypt. Other studies reported an incidence of 20.5%.This improvement could be due to early detection of Egyptian diabetic patients, with better medical care [3].

Brain-derived neurotrophic factor (BDNF) is a protein, encoded by BDNF gene that is located on chromosome11p14.1. Val66Met is a single nucleotide polymorphism (SNP) in the human Pro-BDNF sequence, where there is a valine to methionine substitution, resulting in diminished mature BDNF expression [4]. The retinal trophic factors are affected with DM resulting in cell apoptosis. In DR animal models, retinal neovascularization occurred as a result of decreased BDNF, and peripheral injection of BDNF caused hypoglycemic effects on experimental diabetic animals [5].This work aimed to clarify the association of serum BDNF levels and its gene polymorphism Val66Met with the development of diabetic retinopathy in type 2 diabetic patients.

SUBJECTS AND METHODS

This case-control study was conducted on 60 diabetic patients (30 of them have diabetic retinopathy, while other without retinopathy), In addition to 30 healthy subjects as controls. The patients were recruited from outpatient and medical retina clinics at Research Institute of Ophthalmology (RIO) Hospital, Giza, Egypt, from December 2018 till June 2019. Informed verbal consents were obtained from all participants before enrolment into the study. The study was approved by ethical approval board of faculty of medicine for girls, Cairo, Al-Azhar University, Egypt. Our inclusion criteria were adult Egyptians, of both sexes with type 2 diabetes mellitus (T2DM). Participants were excluded if they had type 1 diabetes mellitus (T1DM), diabetic nephropathy, CNS diseases as stroke, tumor, or epilepsy, eating disorders, autoimmune diseases, previous vitreal surgery, and eye diseases that mask retinal lesions as; glaucoma, dense cataract or severe visual impairment. Retinopathy patients were diagnosed and graded by an expert ophthalmologist through fundus examination to check the retina for vascular changes, leaking blood vessels, or swelling of the macula. Imaging techniques were used for diagnosis; Optical coherence tomography which gives detailed images of eye anatomy and Fundus fluorescein angiography that detects retinal vascular changes using a fluorescent dye. Full history taking and the following clinical data were taken: the duration of DM, medications of DM treatment, history of hypertension, hyperlipidemia, smoking, and Body Mass Index (BMI). All participants were fasting for 10 hours and 8 ml morning venous blood samples were withdrawn from each participant and then divided into; 3 ml dispensed into sterile EDTA tubes (stored at-80°C) to be used for BDNF genotypes , 2 ml in EDTA tubes to be used for HbA1c assay (%), and 3 ml in plain serum tubes (clotted at 37°C, centrifuged at 3000 rpm for 10 minutes, and then the serum was separated), the serum was divided into two parts: one part was used for routine tests and the other part was stored at -20 °C for BDNF estimation by ELISA assay. Spot morning urine samples were collected for microalbumin assay in urine (MAU) (mg/L), to exclude diabetic nephropathy patients.

The following laboratory investigations were done in RIO, clinical pathology department laboratory, with collaboration of clinical pathology department at Al-Zahraa University Hospital, using (Erba XL SysPack 300 analyzer automated analyzer, Gamma Trade company); Fasting blood glucose (mg/dl), complete lipid profile; cholesterol (mg/dl), triglycerides (mg/dl), HDL-C (mg/dl), LDL-C (mg/dl), HbA1c (%), and microalbumin in urine (mg/L); {antigen-antibody reaction, by means of particle-enhanced turbidimetric immunoassay on automated autoanalyzer, Erba XL instrument with the kit supplied by Spectrum-diagnostics}.The serum BDNF levels (ng/ml) were measured with sandwich enzyme linked immunosorbent assay (ELISA), at Al-Zahraa University Hospital, Faculty of Medicine for Girls, Al-Azhar University, using a commercial kit according to the manufacturer instructions (Human BDNF Cat. No. E1302Hu, Bioassay Technology Laboratory, Science and Technology Center company, Egypt) using (DSX fully automated ELISA).

DNA extraction and BDNF Val66Met genotyping

The following procedures were done in RIO, clinical pathology department laboratory, Giza. Genomic DNA was isolated from peripheral blood leukocytes of EDTA tubes, using Spin column DNA isolation kit (The Gene JET, Whole Blood Genomic DNA Purification Mini Kit, #K0781, Thermo Scientific, Analysis Company, Cairo, Egypt). Spectrophotometry was used to assess DNA concentration and purity using (Quawell UV visible spectrophotometer Q5000), which is a micro-volume sample retention system spectrophotometer with full-spectrum (200-850nm) by using the ratio of the reading at 260 nm and 280 nm (A260/A280), where accepted purity had a ratio of A260/A280=1.8. BDNF Val66Met (rs6265) SNP was amplified by Real-Time PCR with the following primers: 5´-ACTCTGGAGAGCGTGAAT-3´ (sense) and 5´- ATACTGTCACACACGCTC-3´ (antisense).The polymorphism was analyzed by allelic discrimination, TaqMan MGB (minor groove binder) probe assay which were designed by (TaqMan Pre-Designed SNP genotyping assays Small-scale, 40X (1500×5-µL rxns) part number (4351379) rs6265 (Analysis company, Cairo, Egypt), using (Applied Biosystems step one Real-Time PCR System) containing probes for both alleles labeled with either FAM or VIC dyes as follows:

[VIC/FAM]:TCCTCATCCAACAGCTCTTCTATCA[C/T]GTGTTCGAAAGTGTCAGCCAATGAT

Statistical analysis

Data was analyzed using the computer program IBM SPSS (Statistical Package for the Social Science; IBM Corp, Armonk, NY, USA) release 22 for Microsoft Windows. One-way analysis of variance (ANOVA) test for variation in means, followed by post-hoc analysis were performed to compare normally distributed numerical variables. Nonparametric Kruskal-Wallis H analysis of variance test was used for comparison of differences in medians. Chi-square (χ^2) test was used to compare categorical data. The spearman rank correlation equation was conducted to do correlations between different variables. For all used statistical tests p-value≥0.05 was considered non-significant, p-value<0.05 was considered significant.

RESULTS

Diabetic retinopathy group comprised 16(53.3%) males and 14(46.7%) females with mean age ±SD, (56±6), (range, 46-70 years). Diabetic without retinopathy group comprised 16(53.3%) males and 14(46.7%) females with mean age ±SD, (57±6), (range, 45-75). Healthy control group comprised 12(40.0%) males and 18(60.0%) females with mean age ±SD, (50±9), (range, 32-70). Age and hypertension frequencies were significantly higher in both diabetic groups compared to healthy control (p<0.05). Diabetic retinopathy patients had a longer diabetes duration and more insulin use compared to diabetic without retinopathy group (p<0.05). Clinical data of all groups were summarized in Table (1). There was no statistically significant difference between the three groups regarding serum BDNF levels (p>0.05), as illustrated in Figure (1). There was a significant increase (p<0.05) of HbA1c and FBS in both diabetic groups compared to healthy control group, and diabetic retinopathy group compared to diabetic without retinopathy for HbA1c only (p=0.001). No statistically significant difference (p>0.05) was found between all groups regarding lipid profile (Triglycerides, cholesterol, HDL-C, and LDL-C), as shown in Table (2). There was no statistical significance between the three groups regarding BDNF genotype distributions or allele frequencies (p>0.05). The genotype distributions and allele frequencies of BDNF Val66Met were summarized in Table (3) and Figure (2). Description of serum BDNF levels in different BDNF genotypes of both diabetic groups were summarized in Table (4) and Table (5). In both diabetic groups, no correlations of serum BDNF levels with BDNF Val66Met genotypes, as shown in Table (6).

Table (1): Comparison between the three groups regarding clinical data after adjusting for multiple comparisons

Parameter \ Groups	DR group (n=30)	Diabetic without retinopathy group (n=30)	Healthy control group (n=30)	Test of significance	p value
Age (years) (Mean ±SD)	56±6	57±6	50±9	F= 7.053***	P1:0.010* P2:0.003* P3:1.000
DM duration (years) (Mean ±SD)	13±7	9±4	-	F= 7.288 ***	0.009*
Body mass index (Mean ±SD)	30±6	29±6	28±4	F= 0.616***	0.543
Hypertension No Yes	10 (33.3%) 20 (66.7%)	17 (56.7%) 13 (43.3%)	28 (93.3%) 2 (6.7%)	x^2= 23.096 **	-
Smoking No Yes	28 (93.3%) 2(6.7%)	23 (76.7%) 7 (23.3%)	24 (80%) 6 (20%)	x^2 = 3.360**	0.186
CVD No Yes	26 (86.7%) 4 (13.3%)	28 (93.3%) 2 (6.7%)	30 (100%)	x^2 = 4.286**	0.117
Treatment of DM Insulin Oral hypoglycemic drug Insulin + oral hypoglycemic drugs	15 (50%) 13 (43.3%) 2 (6.7%)	4 (13.3%) 25 (83.3%) 1 (3.3%)	-	x^2= 1491 **	-

CVD: cardiovascular disease. **x^2: Chi-square test. ***: ANOVA test, *:p<0.05: statistically significant. Post-hoc test; P1: comparison between diabetic retinopathy and healthy control group, P2: comparison between diabetic without retinopathy and control group, P3: comparison between diabetic retinopathy and diabetic without retinopathy groups.

Table (2): Comparison between the three groups regarding laboratory data after adjusting for multiple comparisons

Group / Parameter	DR group (n=30)	Diabetic without retinopathy group (n=30)	Healthy control Group (n=30)	Test of significance	p value
Serum BDNF level(ng/ml) Median (25^{th}-75^{th} percentiles)	0.7 (0.6-1.7)	0.6 (0.5-0.9)	2 (0.7-4.4)	F=0.834***	0.438
HbA1c (%) Mean ±SD	8.8±2.2	7.7±1.6	5.1±0.2	F=40.937**	P1:0.001* P2:0.001* P3:0.050*
FBS (mg/dl) Median(25th-75^{th}percentiles)	193 (131-305)	183 (115-273)	95 (86-107)	F=12.79***	P1:0.001* P2:0.001* P3:1.0
Triglycerides (mg/dl) Median(25th-75^{th}percentiles)	130 (95-169)	149 (96-184)	103 (75-158)	F= 2.546***	0.084
Cholesterol (mg/dl) Median (25^{th}-75^{th} percentiles)	222 (191-262)	235 (210-261)	204 (187-231)	F=2.818***	0.065
HDL-C (mg/dl) Median (25^{th}-75^{th} percentiles)	56 (47-63)	57 (50-64)	56 (46-62)	F=0.082***	0.921
LDL-C (mg/dl) Median (25^{th}-75^{th} percentiles)	142(115-165)	149(128-163)	129(109-140)	F=1.914***	0.154

BDNF: Brain Derived Neurotrophic Factor, FBS: fasting blood sugar, HbA1c: glycated hemoglobin. **: ANOVA test. ***: Kruskal – Wallis H analysis of variance test for non-parametric statistics, *:p<0.05: statistically significant. Post-hoc test; P1: comparison between diabetic retinopathy and healthy control group, P2: comparison between diabetic without retinopathy and healthy control group, P3: comparison between diabetic retinopathy and diabetic without retinopathy groups.

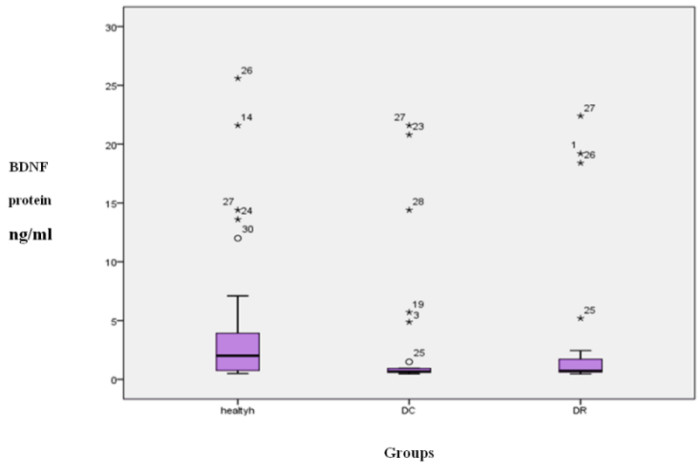

Figure (1): Box plot presenting the median serum BDNF levels of the three groups: The horizontal lines indicate median levels and IQR of serum BDNF levels in the three groups. This means that no statistical significance p>0.05 between the three groups (Diabetic retinopathy, diabetic without retinopathy, and healthy control groups), regarding serum BDNF levels. DC: diabetic without retinopathy group, DR: diabetic retinopathy group, Healthy: healthy control group, BDNF: brain derived neurotrophic factor.

Table (3): Comparison between the studied groups regarding frequency distribution of BDNF genotypes C>T nucleotide SNP rs6265 and allele frequency after adjusting for multiple comparisons

Group / BDNF genotypes	DR group (n=30)	Diabetic without retinopathy group (n=30)	Healthy control Group (n=30)	Test of significance	p value
CC (homozygous wild)	22 (73.3%)	24 (80%)	21 (70%)		
CT (heterozygous)	7 (23.3%)	5 (16.7%)	9 (30%)	x^2=2.352	0.671
TT (homozygous mutant)	1 (3.3%)	1 (3.3%)	0 (0%)		
Alleles (C=155)	51 (85%)	53 (88.3%)	51 (85%)	x^2=0.065	0.798
(T=25)	9 (15%)	7 (11.7%)	9 (15%)		

x^2=Chi-square test of significance

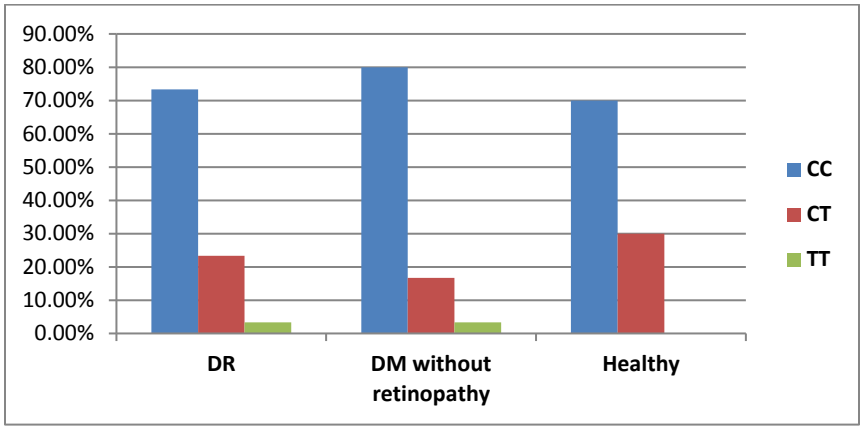

Figure (2): Frequency distribution of BDNF Val66Met genotypes between the studied groups
DR: diabetic retinopathy group, CC: homozygous wild genotype, CT: heterozygous genotype, TT: homozygous mutant

Table (4): Serum BDNF levels in BDNF genotypes of diabetic retinopathy group

Genotype Serum BDNF(ng/ml)	CC genotype	CT genotype	TT genotype
Serum BDNF levels (ng/ml) Median (25th-75th percentiles)	0.7(0.6-1.4)	0.7(0.6-2.1)	0.8

BDNF: Brain derived neurotrophic factor

Table (5): Serum BDNF levels in BDNF genotypes of diabetic without retinopathy group

Genotype Serum BDNF(ng/ml)	CC genotype	CT genotype	TT genotype
Serum BDNF levels (ng/ml) Median (25th-75th percentiles)	0.7(0.5-0.9)	0.6(0.5-3.2)	0.5

BDNF: Brain derived neurotrophic factor

Table (6): Correlation of serum BDNF levels with BDNF Val66Met genotypes in both diabetic groups

Serum BDNF level (ng/ml) BDNF genotypes	Diabetic retinopathy group		Diabetic without retinopathy group	
	r	p value	r	p value
	0.103	0.589	-0.127	0.505

r: Pearson coefficient of correlation

DISCUSSION

Diabetic retinopathy is a critical complication of DM and shares some cellular events of many neurodegenerative diseases as, Multiple sclerosis (MS), Alzheimer's disease (AD), or Parkinson's disease (PD). It results in irreversible and extensive retinal damage, so early diagnosis is necessary to start management and avoid blindness [6]. BDNF plays a vital role in regulating survival, growth, and maintenance of neurons. It is the most considerable neurotrophin in the retina and is produced in retinal ganglion cells (RGCs), which is damaged by diabetic retinopathy, so this protein dysregulation may have a role in DR pathogenesis [7]. This study aimed to find if there is an association of BDNF gene polymorphism Val66Met (rs6265) and its serum levels with the development of diabetic retinopathy in Egyptian type 2 diabetic patients. Up to our knowledge, no study investigated the association between BDNF gene polymorphism Val66Met and its circulating serum levels, with the risk of DR in Egyptian patients with T2DM.

In the present study, we genotyped the population included in the study for BDNF gene polymorphism Val66Met. The observed results demonstrated the presence of three genotypic variants (CC, CT, and TT) among all participants. By applying Hardy-Weinberg principle, the population was in genetic equilibrium. The data obtained after genetic study revealed the absence of a statistically significant difference ($p>0.05$) in genotypic frequencies between the three studied groups: diabetic retinopathy, diabetic without retinopathy, and healthy control group CC wild homozygous (73.3%, 80%, 70%), CT heterozygous (23.3%, 16.7%, 30%), and TT mutant homozygous (3.3%, 3.3%, 0%) respectively. These findings were in accordance with results of a cohort study performed on Chinese type 2 diabetic patients, where Guo et al.[5] found no statistically significant difference ($p>0.05$) in genotypic frequencies between the studied groups: diabetic retinopathy and diabetic without retinopathy groups; CC wild homozygous (32.7%, 33.7%), CT heterozygous (31.9%, 28.9%), and TT

mutant homozygous (35.4%, 37.4%) respectively. In agreement with our result, in a Caucasian population, Krabbe et al. [8] showed no statistically significant difference in genotypic frequencies between the diabetic and healthy control groups; CC wild homozygous (63%, 69%), CT heterozygous (32%, 24%), and TT mutant homozygous (5%, 4%) respectively. Similarly, in a Chinese Han population, Zhen et al. [9] showed no significant difference in genotypic frequencies between the diabetic and healthy control groups; CC wild homozygous (24.4%, 25.4%), CT heterozygous (53.1%, 52.9%), and TT mutant homozygous (22.5%, 21.7%) respectively, suggesting that BDNF Val66Met SNP may be a risk of DM complications, but not directly participate in the risk of diabetes itself. In a study performed on healthy Romanian sample, Vulturar et al. [10] concluded the following BDNF genotypes frequency; 67.03 % CC homozygous, 30.07 % CT heterozygous, and 2.9% TT homozygous mutant, which was close to our findings. As regards to allele frequency in the present study, the T allele percentage was pronounced in diabetic retinopathy patients (15%) compared to diabetic without retinopathy patients (11.7%), however this difference was not statistically significant (P = 0.798). Moreover, the TT genotype was found to be absent in the healthy control group (0%) while it was (3.3%) in both diabetic groups. This may suggest that the T allele confer a risk for development of diabetic retinopathy. Consistent with our findings, in a study performed on Chinese patients, Guo et al.[5] showed no significant difference of BDNF gene allele frequency between groups, with the following allele frequency in the DR patients: 48.7% for C (Val) allele and 51.3% for T (Met) allele, compared to 48.1% for C allele and 51.9% for T allele in the diabetic without retinopathy group. These differences in the BDNF Val66Met genotype distribution and allele frequencies between studies from different populations could be due to ethnicity and racial differences as explained by Pivac et al.[11] who reported that ethnic variation in the BDNF Val66Met genotype distribution may be due to a natural selection of a certain allele or a result of environmental factors influence.

Our study showed decreased serum BDNF levels in both DR and diabetic without retinopathy groups (0.7 ng/ml and 0.6 ng/ml, respectively), compared to healthy control group (2 ng/ml), but it was statistically insignificant ($p>0.05$). A study performed on a Saudi population by Ola et al.[7] found that serum BDNF level was significantly decreased in DR patients compared to that of diabetic without retinopathy ($p < 0.001$), suggesting that DM severity resulted in reduction of BDNF expression which may be associated with early retinal neuropathy to advanced PDR stage, with the possibility of the presence of a common mechanism of diabetes-induced alteration of systemic and retinal BDNF levels. Guo et al.[5] demonstrated that decreased serum BDNF levels were associated with DR ($P<0.0001$), but they could not validate if this lowering was DR specific or not, because serum BDNF level is affected by many factors like daily life style, where diabetic patients have sedentary life style and it was reported that exercise increases serum BDNF levels[12]. On the other hand, Boyuk et al. [13] revealed that serum BDNF level was higher in diabetic patients compared to healthy control subjects, ($P<0.001$), and they thought it is a compensatory increase in BDNF synthesis, that may occur in uncontrolled diabetic patients. In another study with smaller sample size than ours, performed on Chinese patients, Liu et al. [14] found increased serum levels of BDNF in DR patients compared to diabetic without retinopathy; they demonstrated that under low oxygen circumstances, the retina releases neurotrophic factors which induce angiogenesis through Endothelial Progenitor Cells (EPCs) activation in vitro and increased BDNF serum levels were associated with the levels of EPCs. By these findings, they suggest that regulation of retinal neovascularization is by BDNF overexpression.

Our study showed a statistical significant increase ($p<0.05$) of HbA1c and FBS in both diabetic groups compared to healthy control group ($P=0.001$), and a statistical significant increase ($p<05$) of HbA1c and not of FBS in DR group compared to diabetic without retinopathy group ($P=0.050$). HbA1c is the most important indicator of the DM control, representing hyperglycemia, which is the main risk factor in diabetic retinopathy pathogenesis and progression, and this is the case in our study where DR group has higher HbA1c values than diabetic without retinopathy group confirming that DR group was more uncontrolled with the logic sequence of being at higher risk of DM complications in the form of diabetic retinopathy. Consistent with our study, Zhang et al. [15] found a statistical significant increase between DR patients compared to diabetic without retinopathy regarding HbA1c on a Chinese population ($p<0.001$), in addition to existence of retinopathy in a proportion of participants with normal FBS. Gnaneswaran et al.[16] agreed with our results, where they showed a statistical significant increase between DR patients compared to diabetic without retinopathy patients regarding HbA1c in an Indian population ($p<0.000$), and no statistical significance between both diabetic groups regarding FBS ($p=0.356$); they found that higher frequency of DR was associated with increased HbA1c values.

The results reported here in should be considered in the light of some limitations. Firstly, the small sample size failed to identify the relationship between the genotype frequency distribution and the disease in question (diabetic retinopathy). Secondly, lack of follow up of patients and serial measurements of BDNF level to know its relationship with disease progression. Finally, the different genotyping methods have the potential to bias results.

CONCLUSION

The present study revealed the absence of a significant association between BDNF Val66Met polymorphism and diabetic retinopathy in the studied Egyptian population, yet T allele may increase risk of diabetic retinopathy.

Future directions

- Further studies are recommended using a larger sample size to end up with more accurate prevalence of the BDNF gene polymorphism and its genotypic frequency distribution in diabetic retinopathy patients.
- Making large-scale genetic studies based on haplotyping of different SNPs of BDNF gene to evaluate their association with diabetic retinopathy.
- More studies with special emphasis on the role of the T allele in BDNF gene polymorphism Val66Met in diabetic retinopathy.
- Follow up of diabetic patients without retinopathy carrying Val66Met polymorphism and serial measurement of BDNF level to detect its relation with developing retinopathy.
- Study prospectively whether good glycemic control reduces the incidence of DR in T2DM who carry the Val66Met allele.

Financial support: This study did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Conflict of interest: the authors declare no conflict of interest.

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الملخص العربي

الفائدة الإكلينيكية لقياس مستوى المصل من عامل التغذية العصبي المشتق من الدماغ وتعدد شكله الجيني فالين 66 ميثيونين فى مرضى اعتلال الشبكية السكري المصابين بداء السكري من النوع الثاني

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ملخص البحث

الخلفية: يعد داء السكري من أمراض اضطراب التمثيل الغذائي والذى يتميز بارتفاع مستوى سكر الدم نتيجة لنقص إفراز الأنسولين أو عدم عمله بكفاءة أوكليهما. اعتلال الشبكية السكري هو مرض عصبي وعائي يهدد الرؤية ويعتبر أخطر مضاعفات مرض السكري. عامل التغذية العصبي المشتق من الدماغ هو بروتين حيوي لبقاء الخلايا العصبية. يتم انتاجه في شبكية العين بواسطة الخلايا العقدية للشبكية والمشفر بواسطة جين عامل التغذية العصبي المشتق من الدماغ.

الهدف: توضيح ارتباط مستوى المصل من عامل التغذية العصبي المشتق من الدماغ وتعدد شكله الجيني فالين 66 ميثيونين فى تطور اعتلال الشبكية السكري في مرضى السكري من النوع الثاني.

الطرق: أجريت هذه الدراسة للحالات والشواهد على 60 مريضًا مصابًا بالسكري (30 منهم يعانون من اعتلال الشبكية السكري ، بينما الآخرون لا يعانون من هذا الاعتلال الشبكي) ، بالإضافة إلى 30 شخصًا من الأصحاء كمجموعة ضابطة. تم قياس مستوى المصل من عامل التغذية العصبي المشتق من الدماغ باستخدام الفحص المناعي المرتبط بالإنزيم (إليزا)، وتحليل تعدد شكله الجيني فالين 66 ميثيونين بواسطة تفاعل البلمرة المتسلسل فى الوقت الفعلي.

النتائج: لا يوجد فروق ذات دلالة إحصائية بين مرضى اعتلال الشبكية السكرى ،ومرضى السكري ومجموعة الأصحاء الضابطة ، فى نسبة توزيع الشكل الجيني ($p>0.05$)،أو في مستوى المصل من عامل التغذية العصبي المشتق من الدماغ ($p>0.05$).

الاستنتاجات: أظهرت هذه الدراسة أنه لا يوجد ارتباط بين تعدد الشكل الجيني لعامل التغذية العصبي المشتق من الدماغ فالين 66 ميثيونين ومستواه بالمصل فى تطور اعتلال الشبكية السكري في مرضى السكري من النوع الثاني.

الكلمات المفتاحية: عامل التغذية العصبي المشتق من الدماغ، تعدد الشكل الجيني لعامل التغذية العصبي المشتق من الدماغ فالين 66 ميثيونين، اعتلال الشبكية السكري.

الباحث الرئيسي

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