

SHORT-TERM AND LONG-TERM MEMORY WITH BLOOD GLUCOSE LEVEL IN ELDERLY PATIENTS WITH NIDDM-A RELATIONSHIP STUDY

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Abstract:

The aim of this study was to investigate the relationship of short term memory and long term memory with blood glucose level in elderly patients with NIDDM. Only 30 male diabetic type II subjects were selected from different places in West Bengal randomly for this study whose age range from 45 to 55 years. Only Fasting blood glucose level, short term and long term memory were measured for this study. Glucometer was used for the measurement of blood glucose level and short term and long term memory tests scale were used for this study. Pearson product moment Coefficient correlation method was used to find out the relationship of short term memory and long term memory with blood glucose level in elderly patients with NIDDM. In conclusion negative relationship was observed between memory and blood glucose level. Maintaining safe blood glucose levels are strongly recommended.

KEYWORDS:

Short term memory, Long term memory, Blood glucose level.

INTRODUCTION

The prevalence of diabetes is rapidly rising all over the globe at an alarming rate. Diabetes means that blood glucose is too high. Body uses glucose for energy. But having too much glucose in blood can hurt us. When we will reduce risk for problems with kidneys, eyes, nerves, feet and legs and teeth, we will also lower the risk for a heart attack or a stroke.

India leads the world today with the largest number of diabetics in any given country. In the 1970s, the prevalence of diabetes among urban Indians was reported to be 2.1 per cent and this has now risen to 12.1 percent (Sicree et.al., 2006 and Abuja et.al., 2979). India leads the world with largest number of diabetic subjects earning the dubious distinction of being termed the —diabetes capital of the world||. According to the Diabetes Atlas 2006 published by the International Diabetes Federation(Sicree et.al 2006), the number of people with diabetes in India currently around 40.9 million is expected to rise to 69.9 million by 2025 unless urgent preventive steps are taken.

Approximately 90% of people with diabetes have type II diabetes (NIDDM). Some of low levels of insulin production others (who tend to obese) secrete enough insulin. Diabetes is a chronic disease which affects virtually every organ in the human system. The World Health Organization projected that 300 million people will suffer from diabetes by 2025(King H et.al (1998). India has the largest number of diabetic population in the world and it is expected that there will be 69.9 million diabetic populations in India by 2025.

Memory is one of the most important cognitive domains with respect to everyday function and is

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SHORT-TERM AND LONG-TERM MEMORY WITH BLOOD GLUCOSE LEVEL IN.....

the process of storing, encoding, and retrieving information. Different forms of memory are recognized, including sensory, short-term, long-term, and working memory (Baddeley, 1996). Short-term memory refers to the function that temporarily retains stimuli that have just been perceived. Its capacity is limited in terms of the number of items that can be stored and lasts for 20 seconds. Through repetition, information may be transferred from short-term memory to long-term memory. Long-term memory refers to information that is represented on a more permanent basis. Unlike short-term memory, long-term memory has no known limits to capacity and is relatively durable. Working memory is a short-term memory system that allows concurrent retention and manipulation of information (Baddeley, 1986). It is used for thinking about what is already known and for deriving conclusions on the basis of that knowledge; therefore, working memory is fundamental to successful completion of many activities. For example, it is used to remember what has been said at the beginning of a sentence and retain this until the sentence has been completed and is essential for the calculation of mental arithmetic. It allows spatial relations to be updated in our mental map as we move through a new geographical location.

Memory is the explicit or implicit recall of information encoded in the recent or distant past. Current Conceptualizations of memory, however, do not view the construct as a unitary system but rather divide it into hierarchical taxonomic modules based on duration of retention and the type of information that is being retrieved.

Type II diabetes may be associated with impaired cognitive function (Strachan et.al., 1997). A detailed search of the literature has identified 19 controlled studies in which cognitive function in type II diabetes has been examined. The studies vary widely with respect to the nature of the diabetic populations studied and the psychological tests used. Thirteen studies demonstrated that diabetic individuals performed more poorly in at least one aspect of cognitive function. The most commonly affected cognitive ability was verbal memory (Vanhanen et.al., 1997 and Van Boxtel et.al., 1998).

History and duration of NIDDM and high blood pressure are significant risk factors for poor cognitive performance (Elias PK et.al 1997). Lower socio-economic status may be a risk factor in the effect of diabetes on cognitive performance, perhaps by delaying diagnosis and treatment (Robertson t'chabo et.al 1986). The NIDDM patients had impaired control of their learning processes. Elevated serum triglyceride levels may be related to control of mental processing in diabetic patients (Helka et.al 1995). Poor glycemic control in older subjects with NIDDM was associated with decreased cognitive functioning. Verbal learning and memory may be improved with good glycemic control (Gradman et.al 1993). So this study focused to find out the relationship of short-term and long-term memory with blood glucose level in elderly patients with NIDDM and therefore the present study was undertaken.

DEFINATION OF TERMS

DIABETES TYPE 2

Diabetes mellitus type 2 (formerly noninsulin-dependent diabetes mellitus (NIDDM) or adult-onset diabetes) is a metabolic disorder that is characterized by high blood glucose in the context of insulin resistance and relative insulin deficiency (Kumar et.al 2005). This is in contrast to diabetes mellitus type 1, in which there is an absolute insulin deficiency due to destruction of islet cells in the pancreas (Shoback et.al 2011). The classic symptoms are excess thirst, frequent urination, and constant hunger. Type 2 diabetes makes up about 90% of cases of diabetes with the other 10% due primarily to diabetes mellitus type 1 and gestational diabetes. Obesity is thought to be the primary cause of type 2 diabetes in people who are genetically predisposed to the disease.

SHORT TERM MEMORY

Short-term memory, also known as primary or active memory, is the information we are currently aware of or thinking about. In Freudian psychology, this memory would be referred to as the conscious mind. The information found in short term memory comes from paying attention to sensory memories.

Most of the information kept in short-term memory will be stored for approximately 20 to 30 seconds, but it can be just seconds if rehearsal or active maintenance of the information is prevented. While many of our short-term memories are quickly forgotten, attending to this information allows it to continue on the next stage - long-term memory (<http://psychology.about.com/od/memory/f/short-term-memory.htm>). Short-term memory resides in the inside (medial) of the temporal lobe called the hippocampus and entorhinal cortex, and lasts a few minutes to a few weeks before being erased. When you try to recall a conversation or a phone number learned a few minutes to a few weeks ago, these brain areas are activated.

SHORT-TERM AND LONG-TERM MEMORY WITH BLOOD GLUCOSE LEVEL IN.....

LONG TERM MEMORY

Long-term memory refers to the continuing storage of information. In Freudian psychology, long-term memory would be called the preconscious and unconscious. This information is largely outside of our awareness, but can be called into working memory to be used when needed. Some of this information is fairly easy to recall, while other memories are much more difficult to access.

Through the process of association and rehearsal, the content of short-term memory can become long-term memory. While long-term memory is also susceptible to the forgetting process, long-term memories can last for a matter of days to as long as many decades.

(<http://psychology.about.com/od/memory/f/long-term-memory.htm>).

Long-term memory can last a lifetime though scientists are not yet certain which brain areas are involved in this function. Well-learned facts such as the name of a school one attended as a child are stored as long-term memories.

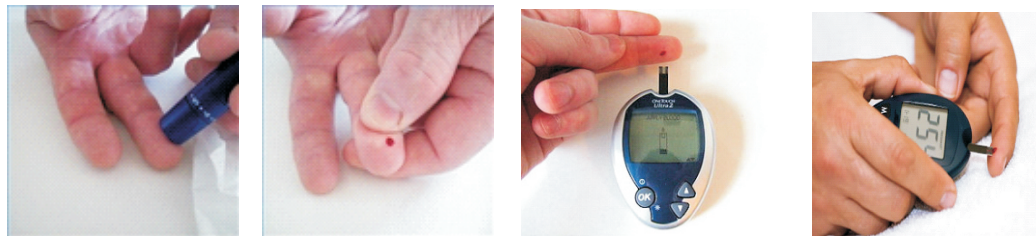
METHOD AND MATERIALS

Thirty Diabetes type II male patients were selected from different places in West Bengal randomly for this study, whose age range from 45 to 55 years. To measure the level of blood glucose, one test was conducted, that was fasting blood glucose test. On the other hand short term memory and long term memory test scale were used prepared by B. B. Asthana.

TEST/TOOLS

FASTING BLOOD GLUCOSE TEST:

Standard and calibrated Blood glucometer instrument prepared by Contour Company was used for measuring the level of blood glucose present in the blood of an individual to the nearest mg/dl. For collecting the Data most common blood sugar test was used i.e. simple finger prick test. The finger prick test measures glucose in milligrams (of glucose) per decilitre of blood (mg/dl). For diagnostic purposes, this was done when the individual has not eaten anything for 10 hours (fasting).



LONG TERM MEMORY TEST (L.T.M.)

Long Term Memory scale was designed by B. B. Asthana (1982). L.T.M. Scale find out the effect of rehearsal of paired-associates on the long term memory of the subject when tested after two minutes of interpolated task. Higher percentage of recall indicates better performance and lower percentage indicates poor performance.

SHORT TERM MEMORY TEST (S.T.M.)

Short Term Memory scale was designed by B. B. Asthana (1982). S.T.M. scale study the effect of different time intervals and association values on short term recall. Higher percentage of recall indicates better performance and lower percentage indicates poor performance.

STATISTICAL PROCEDURE

A Pearson's Product Moment Co-relation statistics was used to find out the pattern of relationship of short term memory and long term memory with blood glucose level in elderly patients with NIDDM.

FINDINGS

TABLE – 1

PERSONAL INFORMATION OF THE SUBJECTS

SUBJECTS	NUMBER	AGE (YEARS) Mean (SD)
DIABETIC TYPE II (MALE)	30	50.66 ± 3.66

TABLE – 02

MEAN, S.D. AND CORRELATION COEFFICIENT OF SHORT TERM MEMORY WITH FASTING BLOOD GLUCOSE LEVEL OF DIABETIC TYPE II SUBJECTS.

VARIABLES	MEAN	S.D	'R'	REMARKS
FASTING BLOOD GLUCOSE LEVEL	145.96	8.87	(-) 0.38	Negatively significant
SHORT TERM MEMORY	45.366	7.83		

R' value required to be significant at 0.05 level of confidence with 28 degree of freedom was 0.361

TABLE -03

MEAN, S.D., AND CORRELATION COEFFICIENT OF LONG TERM MEMORY AND FASTING BLOOD GLUCOSE LEVEL OF DIABETIC TYPE II SUBJECTS

VARIABLES	MEAN	S.D	'R'	REMARKS
FASTING BLOOD GLUCOSE LEVEL	145.96	8.87	(-) 0.44	Negatively significant
LONG TERM MEMORY	40.66	6.45		

R' value required to be significant at 0.05 level of confidence with 28 degree of freedom was 0.361.

DISCUSSION AND FINDINGS

This study aimed to investigate the relationship of short term memory and long term memory with blood glucose level in elderly patients with NIDDM. It was found from the above statistical calculation that a strong negative relationship exists between short term memory and long term memory with blood glucose level in elderly patients with NIDDM.

Few studies (Mitrakou et.al., 1991; Pramming et.al., 1986; Wirsén et.al., and Draelos et.al., 1995) have examined the effects of acute hypoglycaemia on memory function and found that impaired memory functions during acute hypoglycaemia. According to diabetes care 2005 High frequency of and early exposure to severe hypoglycaemia during development negatively affects spatial long-term memory performance. Chalmers et. al., 1991, Hershey et.al., 1993 and Holemans 2001 found that hypoglycemia with specific deficits in long-term memory.

Some studies have proposed that serum total triglyceride levels correlate with memory performance and have shown that elevated triglyceride levels, especially in NIDDM patients, have negative effects on cognition (Helkala et.al., 1995, Perlmutter, 1998; Kuusisto et.al., 1993 and . Koenig, 1992). Triglyceride levels, especially in NIDDM patients, and impaired glucose tolerance, reflect associated metabolic abnormalities, such as insulin resistance and accompanying hyperinsulinemia which have been associated with impaired cognitive performance. Elevated triglyceride levels, especially in NIDDM and impaired glucose tolerance, reflect associated metabolic abnormalities, such as insulin resistance and accompanying hyperinsulinemia (DeFronzo et.al., 1988), which has been associated with

SHORT-TERM AND LONG-TERM MEMORY WITH BLOOD GLUCOSE LEVEL IN.....

impaired cognitive performance (Kuusisto et al., 1993).

Functional neuroimaging studies in humans (Gabrielli et al., 1997 and Stern et al., 1996) have confirmed that medial temporal lobe structures such as the hippocampus and adjacent parahippocampal regions are the principal structures involved with memory performance. Age-related declines are exhibited in processing speed, short-term memory, working memory, and long-term memory. These deficits have been associated with changes in brain structure and function (Hillman et al., 2006).

As you grow older, your body stops making as much of the chemicals brain cells need. These changes can affect memory. Aging generally hampers recent memory so it is strongly recommended the assessment of medical condition periodically and brings blood glucose level within the normal range.

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SHORT-TERM AND LONG-TERM MEMORY WITH BLOOD GLUCOSE LEVEL IN.....

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