



Evaluation of Short Term and Working Memory Status in Type 2 Diabetes Mellitus

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Article History:

Received on: 23 Jul 2020
Revised on: 23 Aug 2020
Accepted on: 24 Aug 2020

Keywords:

Diabetes Mellitus,
Hyperglycemia,
Cognitive Function,
Memory Loss

ABSTRACT



Type 2 diabetes is a disease which is lifelong and which restricts the body from the usage of insulin. Although many problems are associated with diabetes mellitus, cognitive function and intellectual capacity are also affected. The study involves participants who were diagnosed with Diabetes mellitus type 2 for a period of 5 years before the study. The subject design is an observational study that uses a questionnaire that assesses immediate recall, repetition, and a memory function questionnaire was used to study the memory-related changes in type 2 diabetic Mellitus. SPSS VERSION 22 was the statistical software equipped in the study, and the statistical test used was a chi-square test. Results revealed that about 50.5% of the population always forget what people say to them, 37.6% of the population sometimes forget what people say to them and 11.9% of the population never forget what people say to them. Speed information processing, working memory and some attention impairment occur during acute hyperglycemia. Subjects also reported reduced energetic arousal and increased anxiety after hyperglycaemia. Relatively low cognitive function and decreased neuronal activity were relevant to Alzheimer's disease. The study concluded that people with type 2 diabetes mellitus are overwhelmingly affected by cognitive and higher intellectual function with decreased short term and working memory status.

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ISSN: 0975-7538

DOI: <https://doi.org/10.26452/ijrps.v11iSPL3.2999>

Production and Hosted by

IJRPS | <https://ijrps.com>

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INTRODUCTION

Type 2 diabetes is a disease which is lifelong and which restricts the body from the usage of insulin. Although many problems are associated with diabetes mellitus, cognitive function and intellectual capacity are also affected. People with type 2 diabetes are said to have insulin resistance. A less well-identified problem in diabetes mellitus is cognitive function. Short term memory allows storing current information for a short term, and information concerned with the performance of a task is concerned. Researchers in a population-based sample of elderly participants investigated at four occasions in about two years interval. They tested for

spatial ability, speed visor, semantic memory, short term memory, and episodic memory. It resulted that there is no significant neuropsychological test related to diabetes (Hassing, 2004). During hyperglycemia, the working memory, speed information processing and attention impairment were evident. Diabetic subjects also reported with increased anxiety and reduced energetic arousal after hyperglycaemia (Sommerfield et al., 2004).

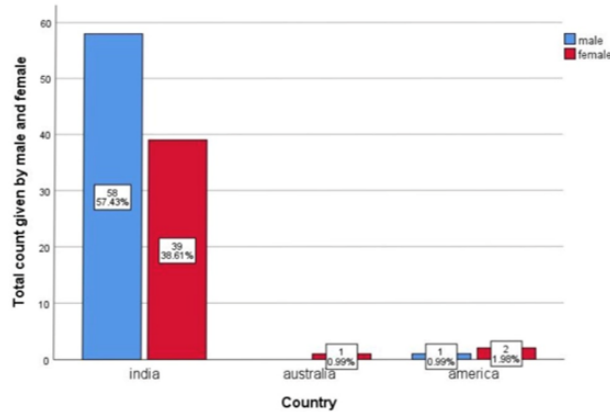


Figure 1: Bar graph represents the association between gender and memory status

Relation cognitive function and decreased neuronal activity were relevant to Alzheimer’s disease. Further longitudinal studies needed to replicate results (Chen et al., 2014). Studies showed statistical significant cognitive impairment, and the magnitude increases with dementia and improved with suitable therapy (Ryan et al., 2006). The sleep patterns vary in every different age group. Sleep deficiency affects the memory in a way that it reduces the person’s ability to focus and learn effectively (Ilankizhai and Devi, 2016).

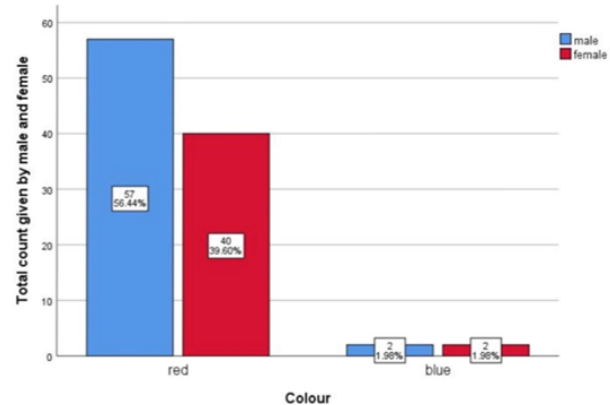


Figure 2: Bar chart represents the association between gender and memory status

Although many factors influence the memory, the present study aimed to evaluate working memory status and short term and in patients with type 2 dia-

betes mellitus.

MATERIALS AND METHODS

The study involves participants who were diagnosed with Diabetes mellitus type 2 for a period of 5 years. The subject design is an observational study that uses a questionnaire that assesses immediate recall, repetition, and a memory function questionnaire was used to study the memory-related changes in type 2 diabetic Mellitus. The total number of people involved was 100.

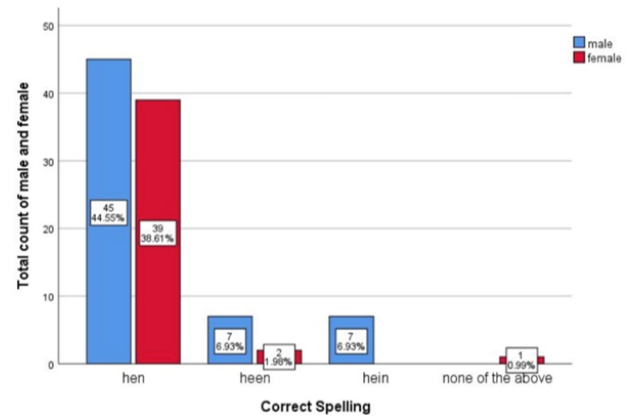


Figure 3: Bar chart represents the association between gender and memory status

Exclusion criteria is smoking; alcohol and those lacking prescription medicine. Inclusion criteria involve patients who were diabetic for the past five years. Self-administered questionnaire of close-ended questions was prepared and distributed through the online survey "GOOGLE FORMS ". The total number of questions is 17; the type of questions is close-ended questions, yes or no type. The Questions were depicted in Table 1. The statistical software used in SPSS version 22 and the statistical test used was a chi-square test. The data were represented as frequency and cumulative percentage analysis.

RESULTS AND DISCUSSION

The results of the present study were represented in pie charts. The data is shown in Table 1 with cumulative percentage, and the results are expressed in a pie chart analysis of the Questionnaire is as follows.

Figure 1, X-axis represents the countries and Y-axis represents the total count of male and female. The study population includes diabetic patients. In the present study, about 58.42% of them were male, and the remaining 41.58% were female. Figure 1 When a question was asked about which country was seen in a picture shown to them, the response

was, about 96% of the people say India, 2% of the people say Australia and 1% of the people say India Figure 2. X-axis represents the colour seen by the people and Y-axis represents the total count of male and female. The Pearson chi-square test showing p-value-0.599 ($\rightarrow 0.05$) which is statistically insignificant. (Sommerfield *et al.*, 2004), who had a similar finding. Regarding the colour of the ball seen by the people are red is 96%, blue is 4%, and green is 0% Figure 3.

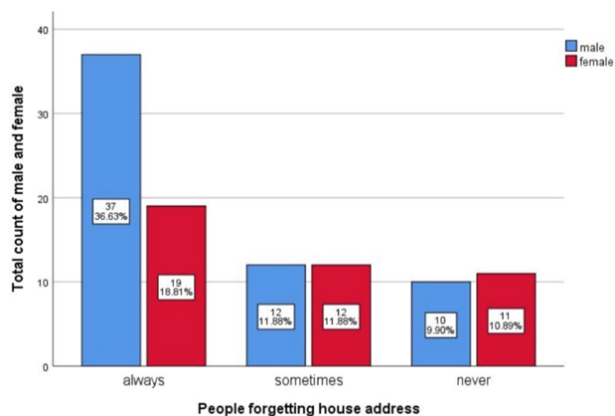


Figure 4: Bar chart representing the association between gender and memory status

The Pearson chi-square test showing p-value-0.483 ($\rightarrow 0.05$) which is statistically insignificant. (Schwartz *et al.*, 2018), who had a similar finding. In regarding the correct spelling of the image, the hen is 83.2%, heen is 8.9%, and hein is 7.9% given the population Figure 4 The Pearson chi-square test showing p-value-0.008. (Table 1). X-axis represents the memory status and the Y-axis represents the total count of male and female.

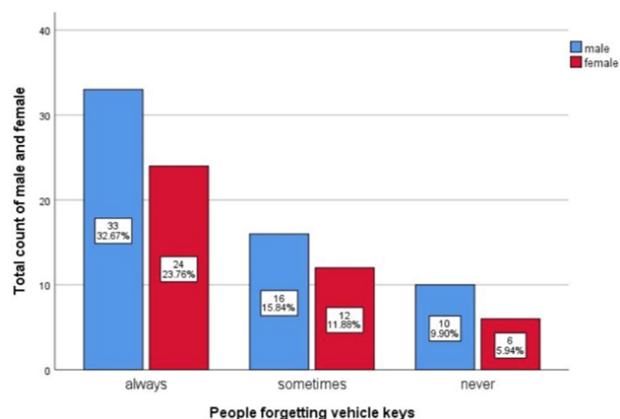


Figure 5: Bar chart representing the association between gender and memory status

Rating of the memory scale one year ago given by the population was 1 is 39%, 2 is 2%, 3 is 18%, 4 is 19%, and 5 is 23%. Rating of the memory scale five

years ago given by the population was 1 is 40%, 2 is 2%, 3 is 16%, 4 is 18%, and 5 is 25% the Pearson chi-square test showing p-value-0.000. In Figure 5 it says that 55.4% of the people always forget the house address, 23% of the people sometimes and 20.8% of the people never forget. X-axis represents the memory status and Y-axis represents the total count of male and female. The Pearson chi-square test is showing p-value-0.000. In Figure 6 it shows, 50.5% of the people always forget the vehicle keys, 23.8% of the people sometimes and 25.7% of the people never forget. The Pearson chi-square test is showing p-value-0.000. 50.5% of the people always forget what people say to them, 37.6% of the people sometimes and 11.9% of the people never forget what people say to them. X-axis represents the memory status and Y-axis represents the total count of male and female. Pearson chi-square test showing p-value-0.000 (Table 1). Memory is the facility of the brain involved in data information which helps in encoded, storing and retrieving the message when needed.

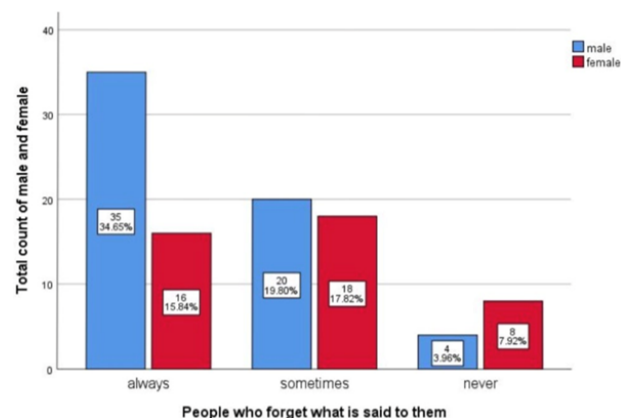


Figure 6: Bar chart depicting the association between gender and memory status

The information from the stimuli is encoded according to the explicit and implicit function with the working memory. The type 2 diabetes mellitus affects the brain resulting in short term memory and working memory (Sommerfield *et al.*, 2004). The types of memory are episodic, semantic, short and long term memory (Ryan *et al.*, 2006).

During the hyperglycemia information processing speed and focussing and attention are impaired. Diabetes mellitus is a risk factor for the disease known as Alzheimer (Takeda *et al.*, 2010; Abigail *et al.*, 2019). Diseases like hypertension and diabetes mellitus are associated with medial temporal lobe atrophy (Korf *et al.*, 2007). Type 2 diabetes mellitus is also related to hypothalamic pituitary adrenocortical axis changes, obesity, hypertension etc. (Choudhari and Jothipriya, 2016). Type 2 dia-

Table 1: Cumulative percentage responses to the questionnaire

S No	Questions	Choice	Response
1.	Gender	Male	58.4%
		Female	41.6%
2.	Current pandemic disease	Corona	100%
		Smallpox	0%
3.	The country you see in the picture	India	96%
		Australia	2%
		America	1%
4.	Colour of the ball seen in the picture	Red	96%
		Blue	4%
		Green	0%
5.	Correct spelling of the following image	Hen	83.2%
		Heen	8.9%
		Hein	7.9%
6.	Rating of the memory scale compared to 1 year ago	1	39%
		2	2%
		3	18%
		4	19%
		5	23%
7.	Rating of the memory scale at present compared to 5 years ago	1	40%
		2	2%
		3	16%
		4	18%
		5	25%
8.	How often you forget the house address	Always	55.4%
		Sometimes	23.8%
		Never	20.8%
9.	How often you forget the vehicle keys	Always	50.5%
		Sometimes	23.8%
		Never	25.7%
10.	How often you forget what people say to you	Always	50.5%
		Sometimes	37.6%
		Never	11.9%

betes mellitus not on glycemic control, contributes to modifying factors to cause potential complications.

Figure 3, X axis represents the spelling given by the people and Y-axis represents the total count of male and female.

HPA axis and the other modifiers which accompany the Type 2 diabetes mellitus is being assessed to determine its impact on the brain volumes. Type 2 diabetes mellitus also produced reduced hippocampal and prefrontal volumes and even verbal declarative memory deficits. Dexamethasone Therapy and dyslipidemia are also greatly associated with decreased cognitive function. Thus it states that obesity and altered cortisol levels contribute to the impact of type 2 diabetes mellitus, which results in the decreased verbal declarative memory perfor-

mance. (Fathima and Preetha, 2016). The physical fitness relaxes our mind, which helps in improving memory (David *et al.*, 2019). There is huge evidence in which regarding the incidence of the hyperglycemia, oxidative stress and inflammatory disorders are the main key factors which contribute to the disease in type1 and type2 diabetes mellitus. Even by the treatment, the attention, simple perceptual-motor function did not show any improvement (Gradman *et al.*, 1993). There is more dysphoria during hyperglycemia which results in reduced energetic arousal, increased anxiety and euphoria (Sommerfield *et al.*, 2004). Snoring is a common general problem faced by most of the common population, snoring destroys sleep which affects the memory (Swathy and Sethu, 2015). Grammar is declarative memory, and morphology is the procedural memory, irregular dorsal stream

is working memory (Stomby *et al.*, 2017). There is a lot of difference in memory varying in people encoding, not maintaining, remaking and perceptual information. Diabete Mellitus causes impair glucose tolerance like dyslipidemia gestation diabetes. It can cause complication like retinopathy, neuropathy, and diabetic food disorder. A neurological disorder holds with hemodynamic impairments, vascular dementia and the cognitive functions, associated with it. (Naik, 2014). The duration of type 2 diabetes with short term and long term working memory causes devastating effects on the brain and mental health of a person (Knutson, 2006). In Diabetes mellitus, the cognitive dysfunction was very not very eminent (Tuomilehto *et al.*, 2008) which is an opposing finding.

Limitations

The limitations of this study are that the study was conducted in a particular geographical area, and more population size can give a better analysis. Biochemical analysis of blood glucose level and HB1AC were not evaluated.

CONCLUSION

This study evaluated the short term memory and memory consolidation status in type 2 diabetes mellitus among diabetic patients. The study concludes that people with type 2 diabetes mellitus are overwhelmingly affected by cognitive and higher intellectual function with decreased short term and working memory status.

ACKNOWLEDGEMENT

The authors would like to thank the study participants for their participation in their kind of cooperation throughout the study.

Funding Support

The authors declare that they have no funding support for this study.

Conflict of Interest

The authors declare that they have no conflict of interest for this study.

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