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Research Article

## Diabetes Mellitus and the Possibility of Developing Dementia

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### ABSTRACT

**Background:** Dementia and cognitive dysfunction have many causes. There is strong evidence that diabetes mellitus (DM) increases the risk of cognitive impairment and dementia. A prophylactic approach, optimal glycaemic control, and identification of diabetic risk factors are essential to preventing cognitive complications.

**Objective:** The main objectives of this study are to assess the severity of dementia by using the Clinical Dementia Rating scale (CDR), and the effect of longevity of diabetes mellitus on the severity of dementia.

**Method:** It is a Hospital-based prospective observational study, in which the patients were enrolled into the study after taking an informed consent form from them based on the inclusion and exclusion criteria.

**Results:** Out of 80 patients, 62(77.5%) were suffering with dementia and 18(22.5%) were found to be normal. The diabetes patients included in this study had a duration of diabetes ranges from 6 to 30 years. Using the CDR scale, 24 of them (30%) were diagnosed with moderate dementia.

**Conclusion:** According to our findings, we emphasize the need to consider DM as a potential risk factor for dementia.

**Keywords:** Dementia, Clinical dementia rating scale, Diabetes mellitus.

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### INTRODUCTION

Diabetes mellitus (DM) is a chronic progressive metabolic disease and a global threat to health. It currently afflicts quite 463 million people worldwide, a minimum of 90% of which are type 2 DM (T2DM) cases [1]. DM is the 15th leading cause of total years of life lost in 2017 [2] and its economic impact is approximately 2% of the global gross domestic product [3]. As the burden of this disease continues to worsen, developing and implementing integrative strategies for its prevention and control is thus a matter of urgency at altogether levels of care.

DM is related to cognitive impairment and dementia, and various epidemiological studies have demonstrated that

T2DM patients have a significantly higher risk of developing dementia [4]. The number of cases of T2DM patients with cognitive impairment or dementia is predicted to extend due to the diabetes pandemic and therefore the concomitant rise in aging populations worldwide [5]. The main objective of our study was to measure the severity of dementia in diabetes mellitus patients, it is measured by using the clinical dementia rating scale (CDR).

### MATERIALS AND METHODS

#### Study Design and Study setting

A hospital-based prospective observational study was conducted for a period of six months from February 2020 to July 2021 at General medicine and Psychiatry

departments of government general hospital (Rajiv Gandhi Institute of Medical Sciences, Kadapa, Andhra Pradesh, India).

### Study population

A total of 80 patients both male and female were selected by using inclusive and exclusive criteria. Patients who are willing to participate in the study and suffering from diabetes with greater than 5 years of duration were enrolled in the study with an age group greater than 30 years. Patients who are not willing to sign the informed consent form, patients with other psychiatric disorders were excluded from the study.

### Ethical statement

The study was approved by the institutional ethical committee, after getting the approval the informed consents were obtained from the participants who were agreed to participate in the study.

### Data collection

#### Clinical dementia rating scale

The CDR might be a five-point scale among that CDR-0 denotes no psychological feature impairment, so the remaining four points are for varying stages of dementia: 0.5 = questionable, or mild insanity 1 = mild 2 = moderate 3 = severe. The CDR score comes from knowledge collected from the informant interview additionally with the topic interview. The six domains used to construct the overall CDR score are Memory, Orientation, Judgment and Problem-Solving, Community Affairs, Home and Hobbies, and Personal Care. to assist in rating the severity in each of the domains, the CDR table, that shows the six psychological feature domains the numerous severity levels, in addition, provides descriptors severity at every

box score. These descriptors are meant to be used as guides. The practitioner got to plan to distinguish that's that the simplest illustration of severity for that precise domain. In things where the practitioner cannot decide between one and a couple of severity levels, the standard rule is to rate a stronger severity level. An associate example would be if memory is between a mild and a moderate severity rating, between a 1 and a two-box score, and so the practitioner cannot make sure where the foremost effective illustration is, the rule would be that memory is rated as a 2.

### Analysis of Data

Student t-test was used for analysing the data. For calculating Mean, Standard deviation, Percentage difference, and Average in Ms. Excel sheet was used. Graph pad prism software was applied to analyse the data.

### RESULTS

In a total of 80 patients among them, 50 were males and 30 were females with an age group of above 30 years were enrolled in the study. We observed that 62 (77.5%) were suffering from dementia and 18(22.5%) were found to be normal as shown in fig-1.

In our study, the diabetic patients' age ranged from 31-80 years. Of them, majority of the patients 36 (45%) were between 51-60 years with a mean  $\pm$  standard deviation of (16  $\pm$ 13.36) as shown in fig-2. The diabetes patients included in this study had a duration of diabetes ranges from 6 to 30 years.

Among them, most of the patients 47 (58.75%) were in a duration of 6-10-years. The severity of dementia is measured by using the CDR scale, among them, 18(22.5%) patients were found to be normal, and the remaining 62(77.5%) patients were suffering from different stages of dementia as shown in the fig-3 and table-1.

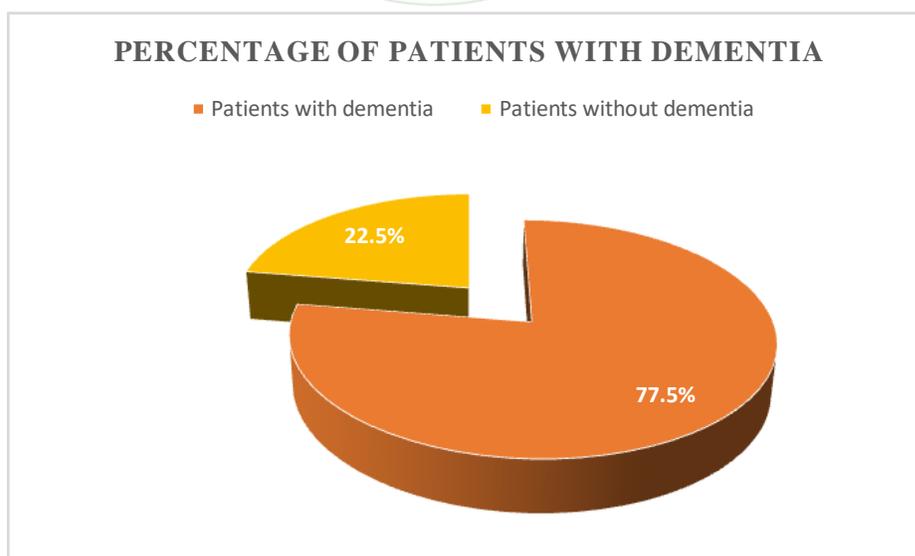


Figure1: Percentage of patients with dementia

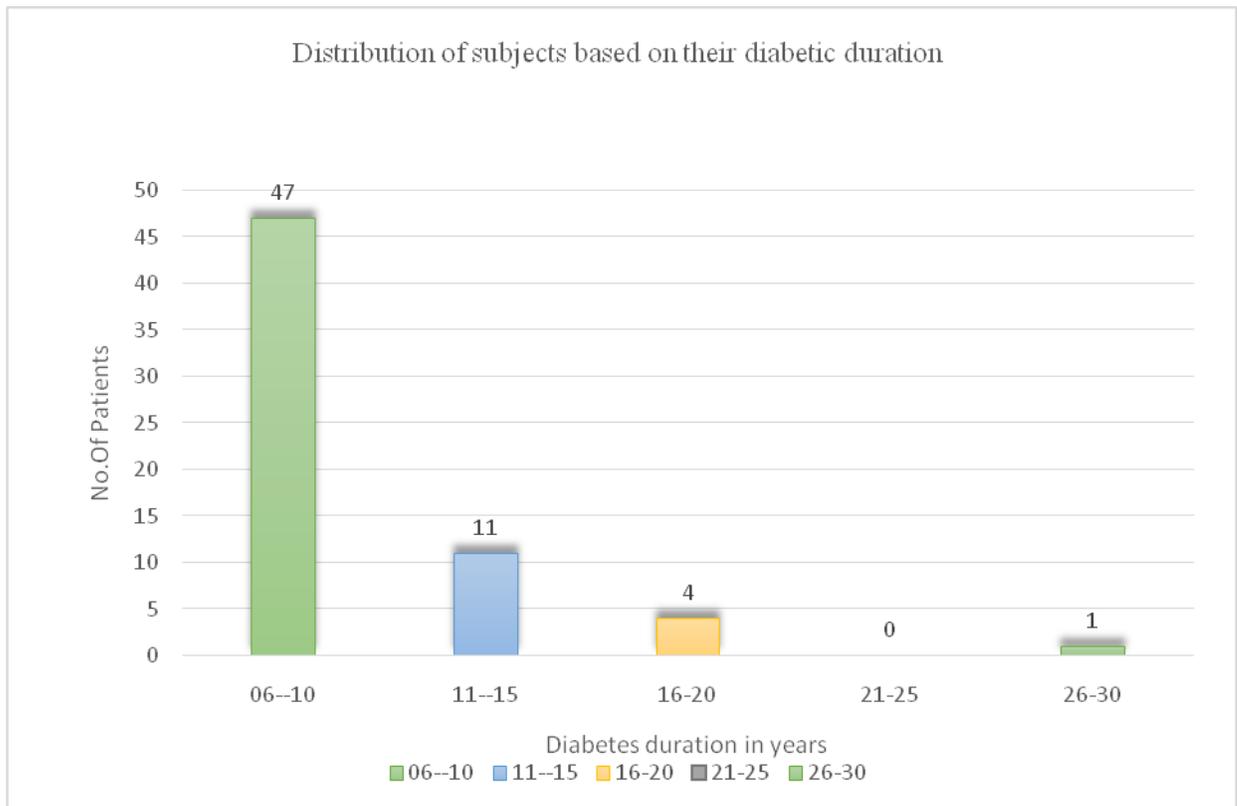


Figure 2: Distribution of subjects based on their diabetic duration

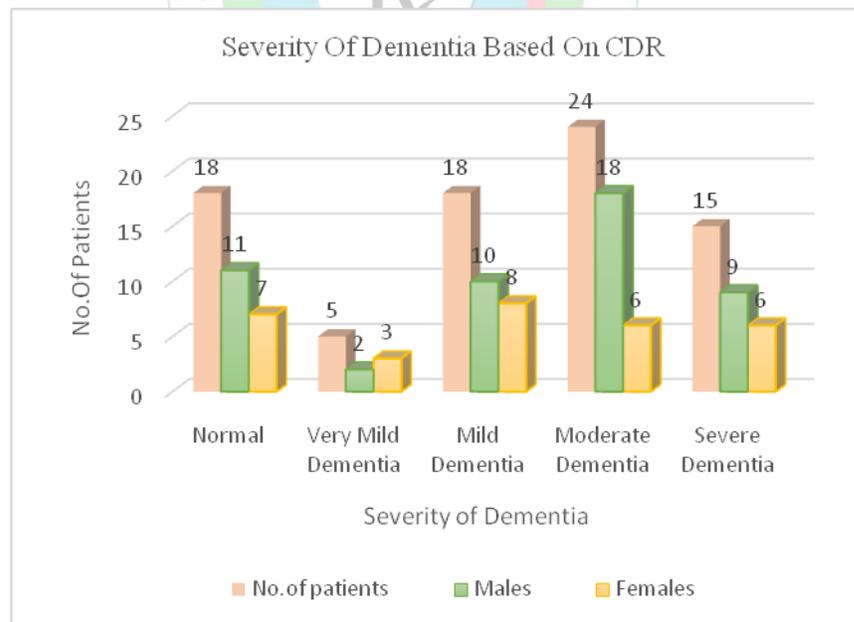


Figure 3: Severity of dementia based on CDR scale

Table 1: Severity of Dementia

S. No	Severity of dementia	No. of patients	Percentage of patients
1	Normal	18	22.5%
2	Very Mild dementia	5	6.25%
3	Mild dementia	18	22.5%
4	Moderate dementia	24	30%
5	Severe dementia	15	18.75%

## DISCUSSION:

In our study, we found that the possibility of developing dementia is more in women when compared with men. According to Saion Chatterjee *et al*,<sup>[6]</sup> women with diabetes have a higher risk of developing vascular dementia than men, and this association was stronger in women. After adjusting for confounders, women had a 12-fold greater risk of developing vascular dementia compared with men, and the excess risk in women was significantly greater than in men.

Paul Cerrato *et al*,<sup>[7]</sup> conducted a study, according to this study diabetic women are 19% more likely to develop vascular dementia than men. The relative risk of vascular dementia was 2.34 in diabetic women but only 1.73 in men. A recent study has found that postmenopausal diabetic women with higher estrogen levels had a greater risk of dementia.

Alaa A Alshari *et al*,<sup>[8]</sup> conducted a study, according to this study women had a higher prevalence and incidence of dementia than men 3.138% versus 2.014% and 0.820 versus 0.576 cases per 100 persons in 2016, respectively.

In our study, we found that the possibility of developing dementia is more in elderly patients with diabetes mellitus. Nisha Nigil Haroon *et al*,<sup>[9]</sup> conducted a study, according to this study there is a higher risk of dementia among seniors with newly diagnosed diabetes. In this population-based study, newly diagnosed diabetes was associated with a 16% increase in the risk of dementia among seniors. Pre-existing vascular disease and severe hypoglycemia were the greatest risk factors for dementia in seniors with diabetes.

Rachel A. Whitmer *et al*,<sup>[10]</sup> conducted a study, this study concluded that among older patients with type II diabetes mellitus, a history of severe hypoglycaemic episodes was associated with a greater risk of dementia.

Kai-Chen wang *et al*,<sup>[11]</sup> conducted a study, according to this study diabetic patients had a significantly higher hazard ratio of Alzheimer's disease. diabetic women  $\geq 65$  years had higher HR (1.52) than diabetic women  $< 65$  years HR (1.34). diabetes may increase the risk of AD in both sexes and all ages. A higher HR of AD was especially notable in older diabetic women.

Brenna cholerton *et al*,<sup>[12]</sup> conducted a study, according to this study type II diabetes mellitus is a robust predictor of cognitive impairment and decline in older adults, and older adults with type II diabetes mellitus experience global cognitive decline at a rate that is double those without type II diabetes over 5 years.

Our study showed that the prevalence of dementia in diabetic patients was 77% as 80 samples were collected among them the dementia was found in 62(77%) patients and 18(33%) were found to be without dementia.

C J vas *et al*,<sup>[13]</sup> conducted a study, as per this study the prevalence of Alzheimer's disease and other dementia is less than that reported from developed countries but similar to results of other studies in India. The prevalence of dementia increased with age and was not related to gender. AD was the most common type of dementia and the prevalence was higher in women than in men. The

prevalence rate for dementia in those aged 40 years and more was 0.43% and for persons aged 65 and above was 2.44%. The prevalence rate for Alzheimer's disease in the population was 0.25% and 1.5% for those aged 65 years and above. KyeongHee Lee *et al*,<sup>[14]</sup> conducted a study, the overall prevalence of dementia was 5.2%. The prevalence was higher in women than in men (6.4% vs 4.0%) and older subjects regardless of sex.

Maria niures Pimentel dos Santos matioli *et al*,<sup>[15]</sup> conducted a study, the prevalence of dementia diagnosis

was similar in diabetics and non-diabetics. In our study, the diabetic age group of the patients diagnosed with dementia ranging from 6-30 years. Among them, dementia was diagnosed highly (58.75%) in the age group 6-10 years,

C. L Leibson *et al*,<sup>[16]</sup> conducted a study, in their study they showed that age-specific incidence rates of dementia for persons with diabetes duration of 5-9, 10-19, and  $\geq 20$  years appeared similar and less than rates for persons with diabetes duration of  $< 5$  years.

In our study the severity of dementia is measured by using CDR scale, among them (22.5%) patients were normal, (6.25%) was diagnosed with very mild dementia, (22.5%) was diagnosed with mild dementia, (30%) was diagnosed with moderate dementia, (18.75%) was diagnosed with severe dementia.

Weili Xu *et al*,<sup>[17]</sup> were conducted a study, in this large-scale population-based twin study, diabetes is independently associated with an increased risk of dementia, Alzheimer's disease, and vascular dementia they found that diabetes is associated with a moderately increased risk of dementia, Alzheimer's disease, and vascular dementia in Swedish twins. they also found that patients with mid-life diabetes had greater dementia risk than those with late-life diabetes.

Bruce DG *et al*,<sup>[18]</sup> conducted a study, in their study that showed that long-term diabetes has a stronger risk effect for the development of cognitive impairment and dementia. Van Harten B *et al*,<sup>[19]</sup> had a Neuroimaging study, in that they have recently demonstrated that people with type 2 diabetes had a moderately elevated risk for lacunes, hippocampal atrophy, and deep white matter lesions, which support the notion that the increased risk of cognitive decline and dementia in people with diabetes is probably due to dual pathological processes involving both cerebrovascular damage and neurodegenerative changes.

## CONCLUSION:

The present study concludes that people with diabetes may have twice the risk of developing dementia compared with people without diabetes. A Clinical Dementia Rating scale was more appropriate to measure the severity of dementia and it was found that most diabetic patients were suffering from a moderate form of dementia.

## CONFLICTS OF INTEREST:

None.

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