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## Effect of dietician consultation on glycaemic control: a cross-sectional survey from western-coast of India.

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### Cover Page Footnote

District Health and Family Welfare Society (R), Udupi People with T2DM participated in the study of Udupi Taluk, Karnataka

# Effect of dietician consultation on glycaemic control: A cross-sectional survey from the western coast of India

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## Abstract

**Introduction:** Type 2 diabetes mellitus (T2DM) is a complex, chronic condition that can cause acute and chronic complications due to poor glycaemic control. This highlights the importance of self-management in achieving optimal glycaemic control. Dietary advice plays a vital role in the self-management of T2DM. **Objective:** To study the effect of dietician consultation on the glycated Hb levels in T2DM patients and to compare it with T2DM patients, not on dietician consultation. **Methods:** This is a cross-sectional study amongst people with T2DM, which was conducted in predominantly rural and suburban communities of Udipi taluk, Karnataka, South India. Using a purposive sampling technique, 467 participants participated in the study. Among the 467 participants, 53 people with T2DM were on dietician consultation, and the equal number of age and duration-matched participants who were not on dietician consultation were analyzed to assess the effect of dietician consultation on glycaemic control. The demographic details and glycated Hb levels (HbA1c) were obtained for both groups. One sample t-test, independent t-test, and Pearson correlation were used for the data analysis. **Results:** On comparing mean HbA1c levels between age and duration-matched groups, the participants not on dietician consultation had a significantly higher HbA1c. **Conclusion:** The dietician consultation has a positive impact on glycaemic control in people with T2DM. Along with medication and lifestyle modifications, the dietician consultation is recommended to achieve better glycaemic control and prevent T2DM related complications.

*Keywords:* dietician consultation, glycaemic control, HbA1c, people with T2DM

## Introduction

Diabetes is fast becoming a significant medical issue in India, comprising approximately about 20% of the

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world's diabetic population. The estimated numbers are even higher, rising by a further 29 million cases to approximately 69.9 million by 2025 (Bansode & Jungari, 2019). According to the diagnostic criteria for diabetes mellitus by the World Health Organization (WHO), a glycated haemoglobin level of 6.5% is recommended as the cut-off point for diagnosing type 2 diabetes (World Health Organisation, 2006).

HbA1c enables monitoring of an individual's glucose control over the past three months, which provides an indication of diabetes control of oneself (Aguiree et al., 2013). The American Diabetes Association (ADA) recommends HbA1c goals based on age, duration of diabetes, and the presence of micro and macrovascular complications (Kim, 2012). In the Standards of Medical Care in Diabetes, the recommended goal for HbA1c is 7.0%, it is a general recommendation to treat most patients (American Diabetes Association, 2003).

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Before addressing the role of diet in the management of diabetes, it is vital to highlight the crucial distinction between type 1 diabetes (T1DM) and type 2 diabetes (T2DM). T1DM is fundamentally due to pancreatic beta-cell destruction resulting in insulin insufficiency. The aetiology of T1DM is very complex, consisting of multiple potential causes ranging from genetic susceptibility to environmental triggers and viral origin. T1DM is managed by the administration of insulin (Otto & Jainta, 2018).

Whereas T2DM is initially characterized by persistently elevated blood glucose, which activates the compensatory mechanism to secrete higher levels of insulin. Following that is the decompensating stage characterized by secretory impairment and destruction of the beta-cells. It has been known that beta-cell homeostasis is highly affected by the quality and the quantity of the food consumed (Weir & Bonner, 2004).

Various pharmacological approaches, targeting insulin resistance or beta-cell function have proven their efficacy in preventing or slowing the progression of T2DM (Deshpande *et al.*, 2008). However, lifestyle intervention, consisting of a combination of a healthy diet and regular exercise has been shown to reduce the risk of progression from impaired glucose tolerance (IGT) to T2DM by up to 58% (Knowler *et al.*, 2002). Extensive research has shown the potential relationship between dietary habits with the risk of developing insulin resistance in T2DM (Weickert & Pfeiffer, 2018), as shown in Asian Indians where a predominance of diabetes is connected to rapid changes in their lifestyle and dietary patterns (Wasir & Misra, 2004).

The therapeutic nutrition aspect was implemented to guide as an evidence-based approach in the management of diabetes through diet, however, implementing it remains a challenge (Vlaar *et al.*, 2017). Although most diabetes guidelines recommend starting pharmacotherapy only after first making nutritional and physical activity changes, this is not always practiced globally. In many settings, other than specialized diabetes centres, where trained nutritionists/educators are available, advice on nutrition for diabetes is given, at best, in a printed menu. In resource-poor settings, however, the patient leaves the clinic with only a list of new medications and little else (Chin *et al.*, 2001).

Dietary intervention or education or counselling to people with diabetes is neglected in most private and public sectors in coastal Karnataka, India, due to the huge outpatient load and lack of trained personnel. In certain setups, patients do receive diet-education leaflets, which contain information on a diabetic diet. Unfortunately, due to lack of education or poor communication, the importance of that information is not taken seriously by people with T2DM. However, some tertiary care hospitals, district-level hospitals, and Non-Communicable Diseases Clinics are providing dietician or diet educator services. It is essential to know the difference in the level of care with dietary consultation, but there are no such studies concerning the south Indian context (Kaveeshwar & Cornwall, 2014).

With this background, this study was designed to explore the effect of dietician consultation in glycaemic control in people with T2DM and to compare with participants, not on any dietician consultation.

## Materials and Methods

A cross-sectional survey was conducted at Udipi Taluk of Karnataka State among 467 people with T2DM. Udipi Taluk had a representation of the urban, semi-urban, and rural population.

### *Sample size, sampling technique, tools, and recruitment*

By using the purposive sampling technique, 467 participants who met the inclusion criteria and were willing to participate were included from the comprehensive registry of persons with diabetes developed under the World Diabetes Foundation 15: 941 project. The structured interview was used which is comprised of demographic proforma (age, gender, duration of T2DM, type of diet, physical activity, type of medication) and health care utilization checklists, and also HbA1c was measured.

Out of 467 participants, 65 participants were on dietician consultation. Among them, 53 T2DM on dietician consultations matching our inclusion criteria were included and the remaining 12 were excluded. From 467 patients, an equal number of age-sex matched T2DM patients who were not on dietician consultation

were used as a control group for comparison. In summary, we have included 106 participants from the 467 subjects with each group consisting of 53 wherein one group is on dietician consultation while the other group is not on dietician consultation.

**Inclusion criteria**

In both groups, T2DM patients from both genders aged between 30-65 years were included. The duration of T2DM illness among the participants in both groups was more than one year. Furthermore, all participants self-reported that they were on a mixed diet and regular exercise, taking oral antidiabetic drugs, followed the diet, and on regular follow-up. One group of participants was on dietician consultation after each follow-up. In contrast, the other group did not go for the dietician consultation but adhered to a diet based on the information received through the peer, social media, mainstream media, etc.

**Exclusion criteria**

T1DM and T2DM patients on insulin therapy were excluded from the study. Besides, patients taking alternative medicines, not following exercise and diet, patients self-reporting diabetes-related complications were excluded from both groups. To have homogeneity, we have excluded the participants who reported to be solely vegetarian or non-vegetarian.

**Biochemical assessments**

Haemoglobin A1c is considered to be the best monitoring marker in people with diabetes because its evaluation provides retrospective information on the glycaemic control for the past 6-8 weeks (Gillery, 2013). Glycosylated HbA1c was measured with Tinaquant® HbA1c Third Generation immunoassay on a fully dedicated analyzer, the Cobas c511 by Roche Diagnostics (Mannheim, Germany). Glycaemic status was categorized as good glycaemic control if HbA1c was ≤7% (World Health Organisation, 2006).

**Statistical analysis**

Descriptive statistics used for continuous variables are expressed as mean and standard deviation (SD) for both groups. The one-sample t-test was used to compare the mean HbA1c values of both groups with the recommended target HbA1c (7%). An independent

t-test was used to compare the mean HbA1c between the two groups.

The Pearson correlation was used to identify the association between the duration of diabetes mellitus and the HbA1c value. Statistical analysis was performed using the SPSS statistical software package, version 23 (IBM SPSS Statistics, Armonk, NY, USA). All the statistical tests were based on the two-tailed hypothesis, and the significance level was defined as  $p < .05$ .

**Results**

Table 1 shows the mean and SD of age, duration of T2DM, and HbA1c in both groups. The dietician consultation group was associated with age group ( $M = 56.1, SD = 7.9$ ) and duration of diabetes mellitus ( $M = 7.3, SD = 5.2$ ) as compared to a non-consultation group associated with a numerically smaller age ( $M = 54.94, SD = 8.5$ ) and slightly shorter duration of diabetes mellitus ( $M = 7.2, SD = 0.6$ ). The comparison of the mean from both groups with the recommended optimal glycaemic control values for HbA1c was 7% using a one-sample t-test. The mean HbA1c levels ( $M = 6.8, SD = 0.1$ ) in T2DM patients on dietician consultation were within the recommended target. But in T2DM patients who were not on dietician consultation have higher mean HbA1c levels ( $M = 8.7, SD = 1.7$ ), which is statistically significant ( $p < .001$ ) compared to the recommended target value of HbA1c.

**Table 1**  
Means for Age, Duration of T2DM and HbA1c

Variables	N = 106							
	Dietician Consultation							
	Yes (n = 53)		No (n = 53)		Yes (n = 53)		No (n = 53)	
Mean	SD	t-value	p-value	Mean	SD	t-value	p-value	
Age in years	56.1	7.9			54.9	8.5		
Duration of illness in years	7.3	5.2			7.2	0.6		
HbA1c (%)	6.8	1.1	-1.202	0.235	8.7	1.7	6.977	.001*

Note. SD = Standard deviation; Level of significance  $p < .05$ ; \* Significant using a one-sample t-test.

Table 2 shows the comparison of mean HbA1c between the dietician consultation group and the non-

consultation group. The group without the dietician consultation was found to have a statistically significant ( $p < .001$ ) higher mean HbA1c value compared to T2DM patients on dietician consultation by using an independent t-test.

**Table 2**  
*Independent t-test comparing Dietician Consultation Group and Control Group on HbA1c*

Variable	Dietician consultation				t-value	p-value
	Yes (n=53)		No (n=53)			
	Mean	SD	Mean	SD		
HbA1c	6.8	1.1	8.7	1.7	-6.500	.001*

Note. SD = Standard deviation; Level of significance  $p < .05$ ; \* Significant using an independent t-test

As shown in Figure 1, there was a positive correlation observed between the duration of diabetes mellitus and HbA1c levels in T2DM patients. However, the correlation was statistically not significant, with a  $p$ -value of .22 and  $r$ -value of 0.54.

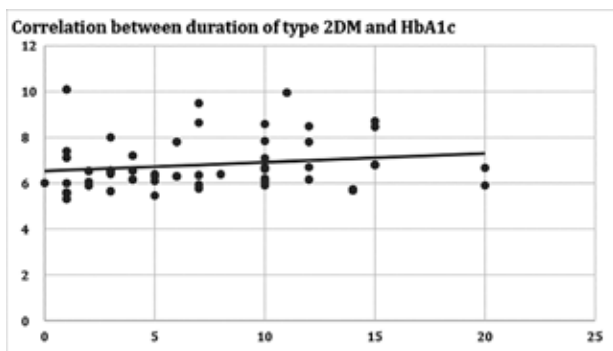


Figure 1. Scatter plot showing correlation between the duration of T2DM and HbA1c levels.

## Discussion

Our study set out with the aim of assessing the importance of dietician consultation to improve glycaemic control in T2DM patients. The most obvious finding which emerged from the data analysis is that people with T2DM on dietician consultation showed significantly better glycaemic control than the non-consulting group. Our results are in accordance with previous studies conducted in India. An audit of 7,490 medical charts demonstrated that patients receiving clinical nutrition education from registered dietitians had better glycaemic control compared to non-registered dietitians (Wilson *et al.*, 2003). This

highlights the significance of using an inter-professional collaboration model of care by using a dietician, which is known to enhance care indicators for patients with chronic diseases, including diabetic patients (Supper *et al.*, 2015).

According to our study, a dietician in health care settings helps achieve better glycaemic control in T2DM patients. This is because dieticians can access the patient’s medical progress and enable them to instill educational awareness regarding diabetes, thereby individualizing education regarding their diet to ensure glycaemic control (Willens *et al.*, 2011; Emerson, 2006). This is supported by the study conducted by the ADA, which states that registered dieticians have better knowledge and skills to understand the complexity of nutritional issues while managing T2DM using nutrition therapy (Franz *et al.*, 2006).

In our study, we have used age, sex, and duration-matched comparison groups. We believe such a comparison minimizes the variations between the groups affecting the results. This is unique for our study because in earlier studies, even though there was better glycaemic control in many of the dietician interventional studies, more favourably so in the group which received dietician consultation. But these studies did not explore the differences specifically in the HbA1c values between the intervention and the control group based on the duration of diabetes mellitus.

In our study, the duration of diabetes mellitus positively correlated with HbA1c. The correlation might be due to progressive impairment of insulin secretion due to increased beta-cell destruction in response to the duration of T2DM (UK Prospective Diabetes Study (UKPDS) Group, 1998). However, this correlation in our study was not statistically significant, which we possibly relate to the lesser number of people with T2DM ( $n = 106$ ) included in the study. The other possible reason could be due to a larger number of people with T2DM in our study group having a shorter duration of diabetes and reasonably good glycaemic control due to better pancreatic beta-cell function. Furthermore, it could be the attainment of better glycaemic control due to effective diet intervention in the dietician consultation group.

Nevertheless, some studies showed that irrespective of the length of T2DM, the dietician consultation has a positive impact on glycaemic control. These findings are shown in a randomized control trial in which two groups with different duration of diabetes have benefited from the nutrition interventions, which was evident by a decrease in HbA1c post-intervention (Franz *et al.*, 1995). We also have a similar view and relate our poor correlation to dietary intervention.

These results further support the hypothesis that dietician consultation does help to maintain glycaemic control in people with T2DM. However, rural India has not reached the optimum stage in the process of providing optimal multidisciplinary care for individuals with diabetes in primary care settings (Narayan *et al.*, 2006). It highlights the importance of enhancing counselling skills and increasing the resources to cultivate a culture of holistic care by incorporating dietary intervention. While planning such measures, one should test and adapt the cost-effective strategies that comprise assessment of determinants of food selection, underlying behaviour, and belief towards the dietary change in Asian Indians with T2DM.

With limitations, findings from this study cannot be generalized due to the relatively small sample size. However, this study sets the platform for ongoing exploration of dietician involvement in medical-nutritional therapy in people with T2DM. Thus, a larger number of people with T2DM who had dietary consultation to compare with the non-consultation group can be recruited for future research from different dietician's care to explore the effects of dietician consultation. Along with this, it is worth exploring the perceptions of dieticians further to understand the perceived benefits of the dietary management of T2DM.

## Conclusion

This research analysis was undertaken to evaluate the effectiveness of dietician consultation in maintaining glycaemic control in people with T2DM. In summary, our results support the concept that dietician consultation is effective in achieving better glycaemic control in people with T2DM. This finding suggests

that there is considerable opportunity for dietitians to enhance the nutrition care for people with diabetes by utilizing supportive counselling styles and focusing on open communication in consultations. These findings also highlight the importance of proper training of health care workers in diet education, to support the lack of registered dietician service in health care settings. Further, this finding is supportive of the counsellors' services made available in the Non-Communicable Disease Clinic at all levels of health care set up under the National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke (NPCDCS) in India.

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