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IMPACT OF A HOLISTIC APPROACH ON 14-DAY GLUCOSE CONTROL AND INSULIN RESISTANCE IN DIABETIC PATIENTS

Endocrinology

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ABSTRACT

Background: Diabetes mellitus (DM) is a prevalent metabolic disorder characterized by chronic hyperglycemia due to insulin resistance and impaired insulin secretion. Managing glucose control and insulin resistance through a holistic approach that combines medical therapy, lifestyle modifications, and nutritional interventions is increasingly recognized as a promising alternative to conventional treatments. **Aims & Objectives:** This study aimed to assess the impact of a holistic approach on 14-day glucose control and insulin resistance in diabetic patients using Continuous Glucose Monitoring (CGM). The study also measured IGF-1 levels as a marker of insulin sensitivity. **Methods:** A randomized control study was conducted at CSS Hospital, Subharti Medical College, Meerut, from February 2023 to August 2024. Sixty diabetic patients aged 18-70 years were randomized into two groups: Holistic (n=30) and Non-Holistic (n=30). The Holistic group received lifestyle interventions, while the Non-Holistic group received only oral hypoglycemics. Flash Glucose Monitoring was used to measure glucose levels, and IGF-1 levels were analyzed. **Results:** The Holistic group showed a significant reduction in glucose levels from Day 1 (190.6 ± 74.1 mg/dL) to Day 15 (134.0 ± 47.7 mg/dL, $p<0.001$), while the Non-Holistic group showed no significant change. IGF-1 levels were significantly higher in the Holistic group (143.83 ± 43.85) compared to the Non-Holistic group (136.24 ± 13.45, $p=0.024$). **Conclusions:** A holistic approach significantly improved glucose control and insulin sensitivity in diabetic patients, as indicated by lower glucose levels and higher IGF-1 levels. The findings support the effectiveness of combining lifestyle modifications with medication.

KEYWORDS

Diabetes; Holistic approach; Glucose control; Insulin resistance; IGF-1 levels.

INTRODUCTION

Diabetes mellitus (DM) is a complex metabolic disorder marked by chronic hyperglycemia, resulting from a combination of insulin resistance and impaired insulin secretion.[1] As the prevalence of diabetes, particularly type 2 DM, continues to rise globally, it has become imperative to explore effective management strategies that go beyond conventional medication.[2] A holistic approach that combines medical therapy, lifestyle modifications, and nutritional interventions offers a promising avenue for managing glucose control and insulin resistance.[3]

The increasing global incidence of type 2 diabetes, especially in countries like India, is a pressing concern. Factors such as urbanization, sedentary lifestyles, poor dietary habits, and obesity have contributed to a surge in diabetes cases, with India projected to have 153 million diabetics by 2045.[4] While conventional medical treatments remain crucial, there is growing evidence that a comprehensive approach, including physical exercise, smoking cessation, alcohol reduction, and a low-calorie, low-fat diet, can significantly improve metabolic outcomes.[5,6]

This study focuses on the impact of a holistic approach, incorporating Continuous Glucose Monitoring (CGM), on glucose control and insulin resistance over a 14-day period. CGM offers real-time insights into blood glucose trends, minimizing the need for frequent and painful finger pricks. It empowers patients to adjust their meals and activities based on their glucose levels, fostering self-regulation and improving treatment outcomes. Additionally, the study evaluates the levels of Insulin-Like Growth Factor-1 (IGF-1), a marker of insulin sensitivity, to assess the influence of lifestyle changes on insulin resistance.

MATERIALS AND METHODS

This randomized control study was conducted in the Department of Medicine, CSS Hospital, Subharti Medical College, Meerut, from February 2023 to August 2024. The aim was to assess the effect of a holistic approach on glycemic control in diabetic patients using Flash Glucose Monitoring (FGM). A total of 60 diabetic patients, aged 18–70 years, meeting the inclusion criteria (Fasting plasma glucose ≥126 mg/dl, PPBS ≥200 mg/dl, and Glycated Hemoglobin ≥6.5%) were recruited for the study.

Study Population and Grouping:

The 60 participants were randomly assigned to two groups of 30 each using computer-generated random numbers:

- **Group 1 (Holistic Group, n=30):** Patients received a holistic approach, including oral hypoglycemics, lifestyle modifications (yoga, brisk walking, cessation of smoking and alcohol), and nutritional therapy (low-calorie, low-fat, and low-carbohydrate diet).
- **Group 2 (Non-Holistic Group, n=30):** Patients received only oral hypoglycemics.

Flash Glucose Monitoring:

Flash Glucose Monitoring (FGM) was performed using the Freestyle Libre Pro system by Abbott. A sensor was applied to the left upper arm to measure glucose levels from interstitial fluid, providing data every 15 minutes for 14 days. Each device recorded up to 96 glucose readings per day, covering a range of 40–400 mg/dl. All patients were trained on the device's operation, risks, and benefits before applying the FGM system.

IGF-1 Measurement:

Insulin-Like Growth Factor-1 (IGF-1) levels were measured in all participants to assess insulin resistance, using a biochemical kit and machine (specific kit details).

Statistical Analysis:

Data were analyzed using SPSS version 21.0. Continuous variables were presented as mean ± standard deviation, and categorical variables as percentages. The unpaired T-test or Mann-Whitney U test was used for comparing group means, and the Chi-square test was employed for categorical variables.

RESULTS

Table 1 Comparison of Demographic and Socioeconomic Variables Between Holistic and Non-Holistic Groups

Variables	Group H (Holistic)	Group NH (Non-Holistic)	P-Value
AGE (MEAN ± SD)	52.7 ± 9.6	51.9 ± 9.5	0.755
GENDER			0.210
Male (%)	18 (66.7%)	14 (50.0%)	
Female (%)	9 (33.3%)	14 (50.0%)	

OCCUPATION			0.580
Business (%)	2 (7.4%)	0 (0.0%)	
CA (%)	1 (3.7%)	1 (3.6%)	
Farmer (%)	3 (11.1%)	4 (14.3%)	
HCW (%)	5 (18.5%)	2 (7.1%)	
Housewife (%)	7 (25.9%)	12 (42.9%)	
Job (%)	4 (14.8%)	6 (21.4%)	
Retail (%)	3 (11.1%)	2 (7.1%)	
Shop (%)	2 (7.4%)	1 (3.6%)	
EDUCATIONAL STATUS			0.261
10th School (%)	3 (11.1%)	6 (21.4%)	
12th School (%)	5 (18.5%)	6 (21.4%)	
Graduate (%)	12 (44.4%)	14 (50.0%)	
Post Graduate (%)	7 (25.9%)	2 (7.1%)	
ECONOMIC STATUS			0.580
Upper (%)	11 (40.7%)	5 (17.9%)	
Upper Middle (%)	0 (0.0%)	2 (7.1%)	
Lower Middle (%)	8 (29.6%)	14 (50.0%)	
Lower (%)	8 (29.6%)	7 (25.0%)	

This table presents a comparative analysis of demographic, occupational, educational, and economic status between Group H (Holistic) and Group NH (Non-Holistic) diabetic patients. No significant differences were observed in age, gender, occupation, educational level, or economic status between the two groups, as indicated by p-values greater than 0.05.

Table 2 Comparison of Medical History and Lifestyle Factors Between Holistic and Non-Holistic Groups

Variables	Group H (Holistic)	Group NH (Non-Holistic)	P-Value
H/O HTN			0.467
Yes (%)	18 (66.7%)	16 (57.1%)	
No (%)	9 (33.3%)	12 (42.9%)	
H/O CAD			1.000*
Yes (%)	0 (0.0%)	1 (3.6%)	
No (%)	27 (100.0%)	27 (96.4%)	
H/O RENAL DISEASE			Na
Yes (%)	0 (0.0%)	0 (0.0%)	
No (%)	27 (100.0%)	28 (100.0%)	
FAMILY H/O DM			0.078*
Yes (%)	7 (25.9%)	2 (7.1%)	
No (%)	20 (74.1%)	26 (92.9%)	
SMOKING			1.000*
Yes (%)	2 (7.4%)	2 (7.1%)	
No (%)	25 (92.6%)	26 (92.9%)	
ALCOHOL			0.611*
Yes (%)	2 (7.4%)	1 (3.6%)	
No (%)	25 (92.6%)	27 (96.4%)	

This table compares the medical history (e.g., hypertension, coronary artery disease) and lifestyle factors (e.g., smoking, alcohol use) between Group H (Holistic) and Group NH (Non-Holistic) diabetic patients. No significant differences were observed between the two groups for any of the variables, as indicated by p-values greater than 0.05.

Table 3 Comparison of Mean Glucose Levels Between Holistic and Non-Holistic Groups on Day 1 and Day 15

Group	Day	Mean Glucose	N	SD	Mean Difference ± S.E.	95% C.I. (Lower)	95% C.I. (Upper)	Paired t-test	P-Value
Holistic	Day 1	190.609	23	74.0520	56.6 ± 12.9	29.9	83.2	<0.001	<0.001
	Day 15	134.043	23	47.7155					
Non-Holistic	Day 1	154.920	25	65.0640	15.4 ± 13.3	-12.0	42.7	0.258	0.258
	Day 15	139.560	25	70.0120					

This table shows the mean glucose levels of the Holistic and Non-Holistic groups on Day 1 and Day 15, along with the standard deviations and mean differences. The Holistic group demonstrated a significant reduction in glucose levels from Day 1 to Day 15, while the Non-Holistic group showed no statistically significant change.

Table 4 Comparison of Mean HbA1c and IGF-1 Levels Between Holistic and Non-Holistic Groups

Variables	Group H (Holistic)	Group NH (Non-Holistic)	P-Value
HbA1c (Acc to CGM)	7.3 ± 1.6	6.7 ± 1.7	0.267
IGF-1 Levels (Mean ± SD)	143.83 ± 43.85	136.24 ± 13.45	0.024

This table compares the mean HbA1c levels and IGF-1 levels between Group H (Holistic) and Group NH (Non-Holistic). While no significant difference was found in HbA1c levels, there was a statistically significant difference in IGF-1 levels between the two groups ($p = 0.024$).

Table 5 Comparison of Dropout Rates, Mortality, and Reasons for Dropouts Between Holistic and Non-Holistic Groups

Variables	Group H (Holistic)	Group NH (Non-Holistic)	Chi-square test	P-Value
OUTCOME				0.587
Non-Dropout (%)	23 (85.2%)	25 (89.3%)		
Dropout (%)	3 (11.1%)	3 (10.7%)		
Died (%)	1 (3.7%)	0 (0.0%)		
REASONS FOR DROPOUTS				0.572
Died (%)	1 (25.0%)	0 (0.0%)		
Got Detached (%)	1 (25.0%)	0 (0.0%)		
Inconvenience in Dressing (%)	1 (25.0%)	1 (33.3%)		
Itching (%)	0 (0.0%)	1 (33.3%)		
Pain (%)	1 (25.0%)	1 (33.3%)		

This table compares dropout rates, mortality, and reasons for dropouts between Group H (Holistic) and Group NH (Non-Holistic). No statistically significant differences were observed between the two groups in terms of dropout rates and reasons for dropouts.

DISCUSSION

The present study found no significant differences between the Holistic and Non-Holistic groups in terms of demographic variables (age, gender, occupation, education, and economic status). Both groups were well-matched. **Joshi and Parikh et al.[7] (2007),** emphasized the importance of well-matched groups in clinical trials on diabetes to reduce bias. In their study of 500 diabetic patients, 45% were male, and the mean age was 53 years, which closely resembles the age and gender distribution in our study. Similarly, **Likitmaskul et al.[8] (2016)** found no significant differences in demographic variables between holistic care groups and control groups in a study involving 300 Type 1 diabetic patients, reinforcing the importance of baseline matching to ensure valid outcome comparisons.

Regarding medical history and lifestyle factors, there were no significant differences in the prevalence of hypertension, coronary artery disease, family history of diabetes, smoking, or alcohol use between the groups. **Chalermsri et al.[9] (2014)** found a similar distribution of hypertension (61% in the holistic group vs 59% in the non-holistic group) and smoking (8% vs 9%) across the groups, with no significant differences, supporting our findings ($p > 0.05$). Additionally, **Popoola et al.[10] (2005)** highlighted that lifestyle factors, such as smoking and alcohol consumption, tend to have limited variation between groups in holistic interventions for diabetic patients, further corroborating our results.

The Holistic group showed a significant reduction in mean glucose levels from Day 1 to Day 15 ($p < 0.001$), while the Non-Holistic group had no significant change ($p = 0.258$). **Diabetes Prevention Program (DPP)[11]**, which showed a 58% reduction in glucose levels among those who underwent intensive lifestyle interventions compared to control groups. However, **Bott et al.[12] (2000)** reported a more modest reduction in glucose levels (mean reduction of 28 mg/dL) in a study involving Type 1 diabetic patients, suggesting that the more comprehensive nature of our holistic approach (including nutritional and physical interventions) may explain the greater reduction in glucose levels.

No significant difference in HbA1c levels was observed between the

groups in our study. However, IGF-1 levels were significantly higher in the Holistic group ($p = 0.024$), indicating improved insulin sensitivity. **Chalermsri et al.[9] (2014)**, who reported a significant reduction in HbA1c levels (7.9% to 7.2%) following holistic interventions.

Dropout rates and reasons, such as sensor detachment and pain, were similar between the two groups, with no statistically significant differences. **Lanning et al.[13] (2015)**, reported dropout rates in a CGM study were 12% across intervention and control groups, with reasons such as pain and device malfunction being similarly reported. The similarity in dropout reasons and percentages suggests that challenges related to CGM usage are common across different studies, regardless of the intervention group.

CONCLUSION

The study found no significant differences between the Holistic and Non-Holistic groups in terms of demographics, medical history, and lifestyle factors, ensuring balanced groups at baseline. While the Non-Holistic group showed no significant glucose changes, the Holistic group demonstrated a significant reduction in glucose levels, highlighting the effectiveness of lifestyle interventions. Although HbA1c levels were similar, IGF-1 levels were significantly higher in the Holistic group, indicating improved insulin sensitivity. Dropout rates and reasons for dropout were comparable between groups, with no significant differences in mortality or adverse effects.

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