



Effectiveness of Red Dragon Fruit Juice in Reducing Blood Glucose Levels among Elderly Patients with Type II Diabetes Mellitus

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<p>Track Record Article</p> <p>Revised: 12 March 2026 Accepted: 28 June 2026 Published: 30 June 2026</p> <p>How to cite: Febriyanti, F., Kontesa, M., Yunir, E., Yuniarti, E., Andika, M., Mitayani, M., Maidelwita, Y., & Primasari, E. P. (2026). Effectiveness of Red Dragon Fruit Juice in Reducing Blood Glucose Levels among Elderly Patients with Type II Diabetes Mellitus. <i>Contagion: Scientific Periodical Journal of Public Health and Coastal Health</i>, 8(2), 552–564.</p>	<p style="text-align: center;">Abstract</p> <p><i>Type II Diabetes Mellitus (T2DM) is a major chronic health problem among the elderly, characterized by persistent hyperglycemia and increased risk of complications. Alongside pharmacological therapy, safe and affordable non-pharmacological interventions are needed to support glycemic control. Red dragon fruit (<i>Hylocereus polyrhizus</i>) contains dietary fiber and bioactive compounds with potential hypoglycemic effects. This study aims to evaluate the effect of red dragon fruit juice on fasting blood glucose levels in elderly patients with Type II Diabetes Mellitus (T2DM). A quasi-experimental pretest–posttest control group design was employed. Fifty elderly patients aged 60–75 years with Type II Diabetes Mellitus were recruited through purposive sampling and assigned to an intervention group (n = 25) or a control group (n = 25). The intervention group received red dragon fruit juice (200–250 mL/day) for 14 days, while the control group received standard care. Fasting blood glucose levels were measured before and after the intervention and analyzed using paired sample t-tests. The intervention group demonstrated a significant reduction in mean fasting blood glucose from 139.20 mg/dL to 121.40 mg/dL, with a mean difference of 17.80 mg/dL (p = 0.001). In contrast, the control group exhibited only a slight decrease from 138.60 mg/dL to 136.80 mg/dL, with a mean difference of 1.80 mg/dL, which was not statistically significant (p = 0.075). These findings indicate that red dragon fruit juice significantly reduces fasting blood glucose levels in elderly patients with Type II Diabetes Mellitus (T2DM). This intervention may be considered a safe and practical complementary nutritional therapy to support diabetes management in the elderly.</i></p> <p>Keywords: <i>Type II Diabetes Mellitus, Red Dragon Fruit Juice, Fasting Blood Glucose, Elderly, Complementary Nutrition.</i></p>
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INTRODUCTION

Type II Diabetes Mellitus (T2DM) is one of the leading chronic health problems among elderly, with its global prevalence continuing to rise. According to the World Health Organization, more than 95% of diabetes cases worldwide are classified as T2DM, with the highest proportion occurring in individuals aged ≥ 60 years. This increased burden is largely attributed to age-related declines in insulin sensitivity, alterations in glucose metabolism, and physiological aging processes (World Health Organization, 2023). The condition is further aggravated by sedentary lifestyles and unbalanced dietary patterns, rendering older adults particularly vulnerable to persistent hyperglycemia (World Health Organization, 2021).

Type II Diabetes Mellitus (T2DM) is a progressive chronic metabolic disorder characterized by hyperglycemia resulting from impaired insulin secretion and/or insulin resistance. This condition can lead to both macrovascular and microvascular complications, significantly diminishing the quality of life of older adults. According to the World Health Organization (WHO) (2022), and the International Diabetes Federation (IDF) (2023), diabetes currently affects more than 422 million people worldwide, with projections indicating an increase to 1.3 billion by 2050, approximately 96% of which are T2DM cases. In addition, the IDF (2023) reported that in 2021 there were 537 million people living with diabetes globally, a figure expected to rise to 643 million by 2030 and 783 million by 2045. In the same year, diabetes was responsible for more than 6.7 million deaths worldwide in 2021.

In Indonesia, the burden of Type II Diabetes Mellitus (T2DM) among the elderly has shown a marked upward trend. Data from the Basic Health Research (*Riskesmas*) indicate that diabetes prevalence increases with advancing age and is disproportionately higher among older adults, contributing substantially to morbidity, disability, and premature mortality due to chronic complications such as cardiovascular disease, nephropathy, neuropathy, and diabetic retinopathy (International Diabetes Federation, 2023). These complications directly affect quality of life, independence, and healthcare costs for older adults and their families (World Health Organization., 2023; PERKENI, 2023).

In West Sumatra, the prevalence of Type II Diabetes Mellitus (T2DM) has risen from 13,519 cases in 2021 to 13,946 cases in 2023. Padang City is among the areas with the highest burden, particularly within the Belimbing, Lubuk Buaya, and Lubuk Begalung Primary Health Centers. The Lubuk Buaya Primary Health Center recorded a notable increase from 983 cases in 2022 to 1,010 cases in 2023 (Dinas Kesehatan Kota Padang, 2024).

The management of Type II Diabetes Mellitus (T2DM) in older adults presents unique challenges. Long-term pharmacological therapy is frequently associated with adverse effects, including hypoglycemia, drug interactions, and reduced adherence due to cognitive decline and comorbidities (Sinclair et al., 2020). Consequently, safe, affordable, and easily applicable non-pharmacological complementary approaches are needed to support glycemic control in older adults alongside medical therapy.

The utilization of functional foods derived from local resources represents a promising complementary approach. Red dragon fruit (*Hylocereus polyrhizus*) contains dietary fiber and natural antioxidants such as *betacyanins*, vitamin C, and polyphenolic compounds which contribute to improving insulin sensitivity and slowing intestinal glucose absorption (Choo &

Yong, 2019). Its high fiber content also plays a crucial role in controlling postprandial blood glucose levels, an essential aspect of managing Type II Diabetes Mellitus (Chen et al., 2024).

Several experimental studies have demonstrated that the consumption of red dragon fruit, including in juice form, can reduce blood glucose levels in individuals with diabetes through mechanisms involving enhanced glucose metabolism and antioxidant activity that mitigates oxidative stress (Putri et al., 2021). The use of juice is particularly relevant for elderly individuals, as aging is frequently associated with dental problems, tooth loss, chewing difficulties, and decreased appetite, which may limit the intake of whole fruits. Juice preparation offers a practical and acceptable alternative, enabling older adults to consume red dragon fruit more easily while still obtaining its nutritional benefits, including dietary fiber, antioxidants, and bioactive compounds that contribute to glycemic control (Wahyuni et al, 2022; Priyanti et al., 2022; Sijabat et al., 2022).

However, scientific evidence specifically examining the effects of red dragon fruit juice on blood glucose levels among elderly patients with Type II Diabetes Mellitus remains limited, particularly within community-based healthcare settings. Most previous studies have focused on the general adult population or hospital-based contexts, whereas elderly patients receiving care at primary healthcare centers may present distinct physiological characteristics and nutritional needs that influence their response to dietary interventions. This study therefore addresses an important research gap by evaluating the effectiveness of red dragon fruit juice among elderly patients with Type II Diabetes Mellitus in a community health center setting, where evidence regarding simple, affordable, and locally available nutritional interventions is still scarce.

Based on these considerations, research investigating the effect of red dragon fruit juice on blood glucose levels among elderly patients with Type II Diabetes Mellitus is both important and timely. The findings of this study are expected to provide a scientific foundation for the development of simple, safe, and locally sourced nutritional interventions as part of promotive and preventive strategies in the management of Type II Diabetes Mellitus among older adults.

METHODS

This study employed a quasi-experimental design using a pretest–posttest control group design. The study aims to evaluate the effect of red dragon fruit juice on fasting blood glucose levels among elderly patients with Type II Diabetes Mellitus. The research subjects were divided into two groups, namely an intervention group and a control group, each consisting of 25 respondents (Sugiyono, 2019). The intervention and control groups were not matched

individually. However, both groups were selected from the same population and met identical inclusion and exclusion criteria to ensure comparability of baseline characteristics.

The study population comprised 316 elderly patients with Type II Diabetes Mellitus residing in the working area of the Belimbing Primary Health Center during the study period. Sample selection was conducted using purposive sampling based on predetermined inclusion and exclusion criteria. The inclusion criteria were elderly individuals aged ≥ 60 years old with a diagnosis of Type II Diabetes Mellitus, willingness to participate as respondents, and the ability to consume juice. The exclusion criteria included elderly individuals with acute complications, allergy to red dragon fruit, and those currently consuming other herbal therapies intended to lower blood glucose levels. This study received ethical approval from the Health Research Ethics Committee of University Perintis Indonesia with approval number 576/KEPK.F1/ETIK/2025. All respondents provided written informed consent before their participation.

The intervention group received red dragon fruit juice at a dose of approximately 200–250 mL per day without added sugar for 14 days, while the control group continued to receive standard diabetes management provided by the primary health center, including routine medical consultations, prescribed antidiabetic medications, and dietary counseling. Prior to the intervention, all respondents underwent fasting blood glucose measurement after an 8–10 hour fast to obtain baseline (pretest) values. After completion of the intervention period, fasting blood glucose measurements were repeated to obtain posttest values in both groups.

The juice was prepared daily from fresh red dragon fruit. Approximately 200–250 grams of peeled fruit were blended with fresh drinking water without filtration and without sugar, allowing the natural dietary fiber to be retained. The retention of fiber was considered important because fiber contributes to delayed glucose absorption and improved glycemic control.

To ensure intervention adherence, the juice was consumed under the supervision of researchers or trained community health volunteers. Daily consumption logs were maintained, and respondents were instructed to finish the entire serving provided. To minimize confounding variables, respondents in both groups were advised to maintain their usual dietary habits and diabetes medications throughout the study period. Dietary intake was monitored using a 24-hour food recall conducted periodically during the intervention period.

Fasting blood glucose levels were measured using a calibrated Accu-Chek glucometer and recorded in mg/dL. Data analysis was performed using univariate analysis to describe respondent characteristics and bivariate analysis to assess within-group differences in fasting

blood glucose levels before and after the intervention. Data normality was assessed using the Shapiro–Wilk test. Paired sample t-tests were used to evaluate pretest–posttest changes within the intervention and control groups. Statistical significance was established at $p < 0.05$.

RESULT

Table 1. Mean Fasting Blood Glucose Levels Before and After Red Dragon Fruit Juice Administration in the Intervention Group

Blood glucose level	N	Mean	Standar deviation	Min	Max
Before	25	139.20	22.60	110	190
After	25	121.40	18.30	95	165

Table 1 shows that the mean fasting blood glucose level in the intervention group before red dragon fruit juice administration was 139.20 mg/dL, with a standard deviation of 22.60 mg/dL. After the intervention, the mean fasting blood glucose level decreased to 121.40 mg/dL with a standard deviation of 18.30 mg/dL. These results indicate a reduction in fasting blood glucose levels following the administration of red dragon fruit juice.

Table 2. Mean Fasting Blood Glucose Levels Before and After Red Dragon Fruit Juice Administration in the Control Group

Blood glucose level	n	Mean	Standar deviasi	Min	Max
Before	25	138.60	21.90	112	188
After	25	136.80	22.10	110	185

In the control group, the mean fasting blood glucose level before the initial measurement was 138.60 mg/dL and decreased to 136.80 mg/dL after the observation period. The change observed in the control group was relatively small compared to the intervention group, indicating that without red dragon fruit juice administration, no meaningful reduction in fasting blood glucose levels occurred.

Table 3. Differences in Mean Fasting Blood Glucose Levels Before and After Red Dragon Fruit Juice Administration in the Intervention and Control Groups

Blood glucose level in the intervention group	Mean	Standar deviasi	Mean difference	p-value
Before	139.20	22.60	-17.80	0.001
After	121.40	18.30		
Blood glucose level in the intervention group	Mean	Standar deviasi	Mean difference	p-value
Before	138.60	21.90	-1.80	0.075
After	136.80	22.10		

Based on Table 3, in the intervention group receiving red dragon fruit juice, the mean fasting blood glucose level before the intervention was 139.20 mg/dL with a standard deviation of 22.60, while after the intervention the mean fasting blood glucose level decreased to 121.40

mg/dL with a standard deviation of 18.30. The statistical analysis showed a mean reduction in fasting blood glucose levels of 17.80 mg/dL following red dragon fruit juice administration. The paired *t*-test yielded a *p*-value of 0.001 ($p < 0.05$), indicating a statistically significant difference in fasting blood glucose levels before and after the intervention in the intervention group.

In contrast, in the control group, the mean fasting blood glucose level showed only a slight decrease from 138.60 mg/dL to 136.80 mg/dL. The change in mean fasting blood glucose levels before and after the observation period in the control group did not indicate a statistically significant difference. This finding suggests that the significant reduction in fasting blood glucose levels observed in this study primarily occurred in the group that received the red dragon fruit juice intervention.

Figure 1. Mean Reduction in Fasting Blood Glucose Levels

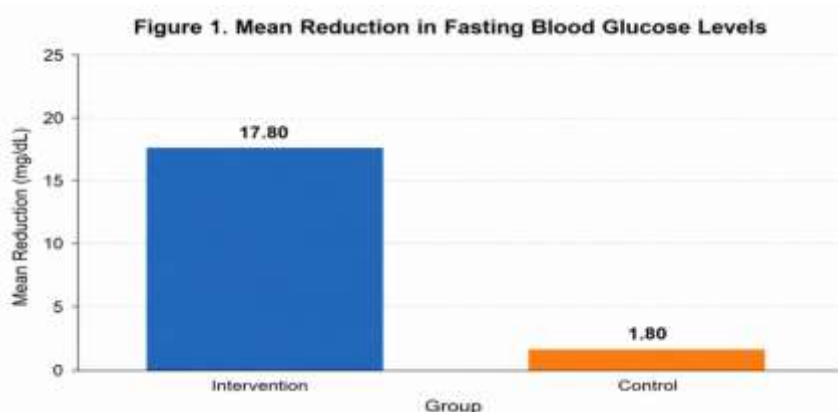


Figure 1. Comparison of Mean Reduction in Fasting Blood Glucose Levels Between the Intervention and Control Groups. The intervention group showed a greater reduction in fasting blood glucose levels (17.80 mg/dL) compared with the control group (1.80 mg/dL) during the 14-day study period.

DISCUSSION

Fasting Blood Glucose Levels in the Intervention Group

The findings of this study demonstrate that the intervention group experienced a mean reduction in fasting blood glucose levels of 17.80 mg/dL after receiving red dragon fruit juice for 14 days, and this difference was statistically significant ($p = 0.001$). This reduction indicates that red dragon fruit juice exerts a clear hypoglycemic effect in elderly patients with Type II Diabetes Mellitus. Theoretically, fasting blood glucose reflects the balance between hepatic glucose production and peripheral insulin sensitivity, both of which are commonly impaired in

older adults due to age-related physiological changes and increased insulin resistance (Sinclair et al., 2020; Zainuddin et al., 2021).

The observed reduction in fasting blood glucose levels in the intervention group may be attributed to the soluble fiber content of red dragon fruit, which slows intestinal glucose absorption and reduces the rate of post-absorptive glucose elevation. Dietary fiber also enhances satiety and contributes to the stabilization of fasting blood glucose levels (Choo & Yong, 2019). In addition, red dragon fruit contains *betacyanins* and polyphenols with antioxidant properties that help mitigate oxidative stress, a key factor in the development of insulin resistance in patients with Type II Diabetes Mellitus (Zainuddin et al., 2021).

These findings are consistent with previous studies (Putri et al., 2021) and (Wahyuni & Sari, 2022), which reported that regular consumption of red dragon fruit juice significantly reduced blood glucose levels in individuals with diabetes. Other experimental studies have further demonstrated that antioxidants in red dragon fruit can enhance insulin sensitivity and glucose metabolism by protecting pancreatic β -cells from oxidative damage (Priyanti et al., 2022).

Fasting Blood Glucose Levels in the Control Group

In contrast, the control group exhibited only a minimal reduction in mean fasting blood glucose levels of 1.80 mg/dL, which was not statistically significant ($p > 0.05$). Theoretically, such minor fluctuations in fasting blood glucose are considered normal physiological variations in patients with Type II Diabetes Mellitus, particularly among older adults, and may be influenced by daily dietary intake, physical activity, sleep quality, stress, and medication adherence (Association Diabetes American, 2024).

The absence of a significant change in the control group suggests that standard care alone, without additional nutritional intervention, is insufficient to produce meaningful glycemic improvement over a short period. This finding is consistent with diabetes management frameworks emphasizing that effective glycemic control requires multidimensional interventions, including dietary regulation, physical activity, education, and targeted nutritional support (Isa et al., 2023)

Similarly, Imamura et al. (2023) reported that glycemic responses to standard treatment in older adults tend to be slower due to declining metabolic function and increased insulin resistance associated with aging. Consequently, without complementary interventions such as functional food supplementation, changes in fasting blood glucose levels are likely to remain minimal.

Possible Explanations for Blood Glucose Reduction in the Control Group

Although the control group did not receive red dragon fruit juice, a slight reduction in fasting blood glucose levels (1.80 mg/dL) was observed during the study period. However, this reduction was not statistically significant ($p = 0.075$). Several factors may account for this finding. First, participants in the control group continued to receive standard diabetes management provided by the primary healthcare center, including antidiabetic medications such as metformin and other prescribed treatments, which may have contributed to maintaining or slightly improving glycemic control.

Second, participation in the study itself may have heightened respondents' awareness of diabetes self-management. Regular monitoring, interaction with researchers, and repeated blood glucose assessments may have encouraged participants to adhere more closely to medication regimens, dietary recommendations, and healthy lifestyle behaviors. This phenomenon is commonly referred to as the Hawthorne effect, whereby individuals modify their behavior because they know they are being observed.

Therefore, the small reduction observed in the control group is likely attributable to routine diabetes management and increased health awareness during the study period rather than to a specific nutritional intervention.

Comparison of Intervention and Control Effects

The marked difference in mean fasting blood glucose reduction between the intervention group (-17.80 mg/dL) and the control group (-1.80 mg/dL) demonstrates that the effect of red dragon fruit juice intervention was substantially stronger than that of observation alone. Statistically, this difference confirms that red dragon fruit juice contributed significantly to the reduction of fasting blood glucose levels in elderly patients with Type II Diabetes Mellitus.

It means medical nutrition therapy emphasizes the role of functional foods rich in dietary fiber and antioxidants in improving glycemic control as an adjunct to pharmacological therapy (Adhikari et al., 2023). Red dragon fruit meets these criteria, as it contains fiber, vitamin C, flavonoids, and *betacyanins* that play important roles in regulating glucose metabolism (Inoue et al., 2023).

Biological Mechanisms of Red Dragon Fruit in Glycemic Control

Red dragon fruit (*Hylocereus polyrhizus*) reduces blood glucose levels through several interrelated biological mechanisms, particularly at the levels of digestion, insulin sensitivity, and pancreatic β -cell function. Its soluble fiber content delays gastric emptying and glucose absorption in the small intestine, thereby suppressing postprandial glucose spikes and

stabilizing fasting blood glucose levels. This mechanism is consistent with medical nutrition therapy guidelines emphasizing the importance of fiber intake in glycemic control for patients with Type II Diabetes Mellitus (Al-Azayzih et al., 2023).

Moreover, red dragon fruit contains *betacyanins*, flavonoids, and polyphenols with antioxidant and anti-inflammatory activities that reduce oxidative stress and low-grade inflammation two major contributors to insulin resistance. Reduced oxidative stress enhances peripheral insulin sensitivity and improves glucose uptake by muscle and adipose tissue (Albadrani et al., 2023; Albakistani et al., 2023). Antioxidant compounds in red dragon fruit have also been reported to protect pancreatic β -cells from oxidative damage, thereby helping to maintain optimal insulin secretion and suppress hepatic glucose production (gluconeogenesis) (Aleidi et al., 2023). Through these mechanisms, regular consumption of red dragon fruit juice provides a physiological and safe hypoglycemic effect, particularly for elderly patients with Type II Diabetes Mellitus (T2DM), as recommended in lifestyle- and nutrition-based diabetes management approaches by the World Health Organization (Wajsbrot et al., 2023).

Comparison with Previous Studies and Implications

The findings of this study reinforce previous evidence indicating that local food-based interventions hold significant potential for managing Type II Diabetes Mellitus in community settings, especially among older adults. Red dragon fruit juice is considered practical, safe, and easy to implement, which may enhance adherence to non-pharmacological interventions among the elderly (Wahyuni & Sari, 2022), (International Diabetes Federation, 2023).

Overall, this study demonstrates that administering red dragon fruit juice for 14 days significantly reduced mean fasting blood glucose levels by 17.80 mg/dL in elderly patients with Type II Diabetes Mellitus ($p = 0.001$). These findings are consistent with prior research showing hypoglycemic effects of red dragon fruit in both juice and other processed forms. Experimental studies by Putri et al. (Putri et al., 2021a), reported significant reductions in blood glucose and insulin resistance in Type II Diabetes Mellitus models through decreased oxidative stress and improved β -cell function. Similar findings were reported by Wahyuni and Sari (Wahyuni & Sari, 2022), although the magnitude of glucose reduction varied depending on dosage and participant characteristics.

In addition, a meta-analysis by (Ahmed et al., 2023), concluded that dragon fruit consumption positively affects glycemic control in individuals with prediabetes and Type II Diabetes Mellitus, particularly fasting and postprandial glucose levels. Although heterogeneity among studies was noted, the consistent direction of effect supports the potential of dragon

fruit as an adjunct nutritional intervention. Recent comprehensive reviews by (S. Y. Chen et al., 2024) and (Nishikito et al., 2023) further confirm that the bioactive compounds in red dragon fruit, such as *betacyanins*, flavonoids, and polyphenols-contribute to reduced oxidative stress, improved insulin sensitivity, and modulation of glucose metabolism, thereby theoretically supporting the results of this study (Anjali et al., 2023).

Compared with the control group in this study, which exhibited only a minimal and non-significant reduction in fasting blood glucose levels (1.80 mg/dL), these findings are consistent with reports by Sinclair et al. (Sinclair et al., 2020) and (Alqahtani & Alsulami, 2023), indicating that standard care without specific nutritional intervention tends to produce limited short-term glycemic changes in older adults. This strengthens the interpretation that the significant reduction observed in the intervention group was attributable to the biological effects of red dragon fruit juice rather than to normal physiological variation or time-related factors (Arte et al., 2023).

Theoretical and Clinical Implications

In conclusion, the overall findings of this study strengthen existing empirical evidence that red dragon fruit juice has a consistent hypoglycemic effect in line with previous experimental, clinical, and systematic review studies. The primary contribution of this study lies in its focus on elderly populations and community-based settings, which remain relatively underrepresented in the literature (Chen et al., 2023). The results support the theoretical concept that modulation of oxidative stress and enhancement of insulin sensitivity through functional food consumption can improve fasting blood glucose levels in older adults. Clinically, red dragon fruit juice may be considered a complementary nutritional intervention in the management of Type II Diabetes Mellitus, particularly in primary healthcare and community settings, without replacing standard pharmacological (Firima et al., 2023).

Study Limitations

This study has several limitations. First, the intervention period was relatively short, lasting only 14 days, which limits the ability to evaluate long-term glycemic outcomes such as glycated hemoglobin (HbA1c). Second, the sample size was relatively small and was drawn from a single primary healthcare center, which may limit the generalizability of the findings to broader populations. Third, although dietary intake was monitored using 24-hour food recall, variations in daily food consumption and physical activity could not be completely controlled. Therefore, future studies should involve larger sample sizes, longer intervention periods, and additional indicators of glycemic control to further validate the effectiveness of red dragon fruit juice in elderly patients with Type II Diabetes Mellitus.

CONCLUSION

This study concludes that the administration of red dragon fruit juice for 14 days had a significant effect on reducing fasting blood glucose levels in elderly patients with Type II Diabetes Mellitus. The intervention group demonstrated a mean reduction in fasting blood glucose levels of **17.80 mg/dL**, which was statistically significant ($p = 0.001$), whereas the control group showed only a small and non-significant reduction ($*1.80 \text{ mg/dL}$; $p > 0.05$).

These findings indicate that red dragon fruit juice exerts a clear hypoglycemic effect, which is most likely associated with its dietary fiber content and bioactive antioxidant compounds that help slow glucose absorption, reduce oxidative stress, and improve insulin sensitivity. Therefore, red dragon fruit juice has the potential to be used as a safe, practical, and locally based complementary nutritional intervention in the management of Type II

Diabetes Mellitus among the elderly, without replacing standard pharmacological therapy. Future studies are recommended to employ longer intervention durations, larger sample sizes, and the assessment of long-term glycemic parameters such as HbA1c to strengthen the evidence regarding the sustained effectiveness of red dragon fruit juice in the long-term management of Type II Diabetes Mellitus.

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