

The utility of Flash Glucose Monitoring for Patients with Type 1 Diabetes Mellitus During Fasting in Ramadan

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Background: Muslims are obligated to fast in Ramadhan; when meal times and sleep patterns change⁽¹⁾ Patients with chronic illnesses, including some patients with type 1 diabetes, are exempted from fasting⁽²⁾. 80% of Diabetic patients fast when physicians advise them not to.⁽³⁾ Patient education is recommended prior to Ramadhan to minimize frequency of diabetes complications.^(4,5,6) As glucometer does not reveal the real variability of glucose levels during fasting,^(7,8) FreeStyleLibre system is accurate for interstitial glucose measurement, with accuracy remaining stable over 2 weeks of wear.⁽⁹⁾ This study examines glucose level fluctuations during Ramadan fasting in patients with T1DM using flash glucose monitoring (FGM).

Method: In this pilot cross-sectional study, patients were monitored with FGM and completed a survey after Ramadan. Time in range, glucose variability, changes in HbA1c, and renal function was evaluated. IRB approval and informed consent were acquired prior to the study. (SPSS) Version 25 was used to analyze the data.

Results: 8 adults (5 females, 3 males) were recruited. 25% of patients who were not able to fast in the previous year were able to fast in the current year while using FGM. Glucose variability during Ramadan was reduced by 4.05 ± 7.00 %. (P-value 0.17). The time in range before Ramadhan was $51.00\% \pm 10.75$, during Ramadhan was $53.42\% \pm 14.83$, and post-Ramadhan was $55.85\% \pm 10$. HbA1c (P: 0.465) and creatinine (p:0.315) did not change indicating that glycemic control and renal function were maintained. Figure 1 and 2 shows timing of hypoglycemic and hyperglycemic episodes.

Conclusion: Active glucose monitoring using FGM with pre-Ramadan counselling and patient education aids in empowering patient to fast safely and maintain glycemic control during month of Ramadan and avoid complications including DKA and severe hypoglycemia.

Keywords: Type 1 Diabetes Mellitus, Fasting, Flash Glucose monitoring, Ramadan

Fig-1 Frequency of Hyperglycemia

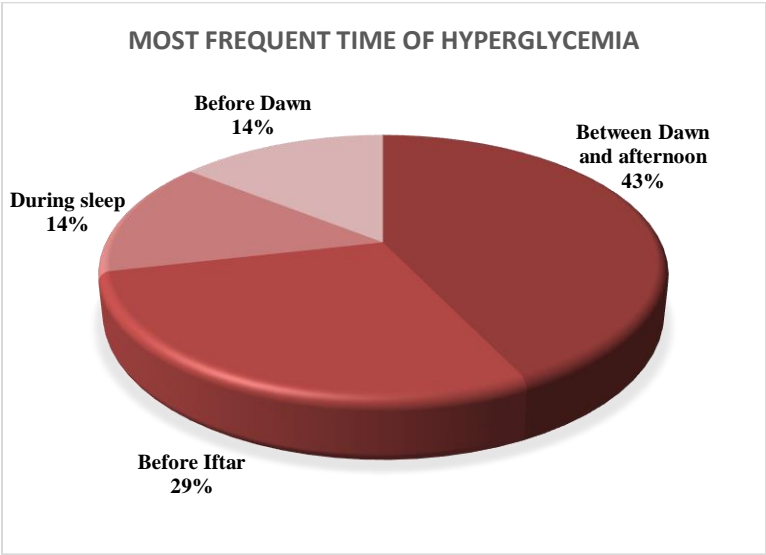
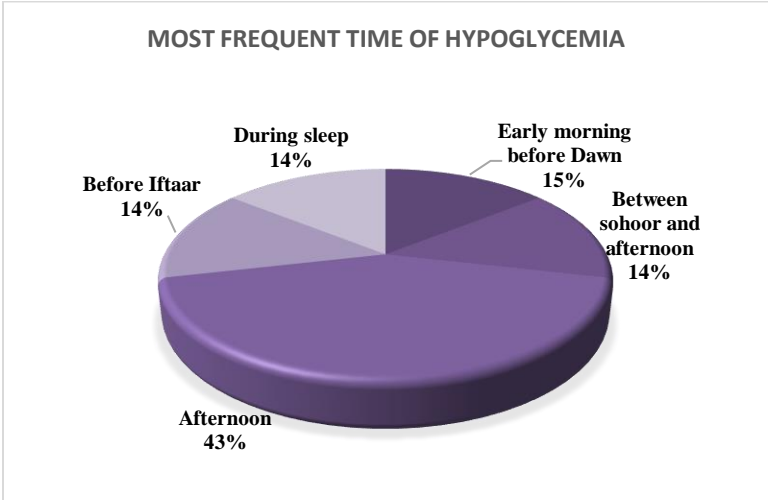


Fig-2 Frequency of Hypoglycemia:



REFERENCE:

{1}-S. Bahijri, A. Borai, G. Ajabnoor, et al. Relative metabolic stability, but disrupted circadian cortisol secretion during the fasting month of Ramadan. *PLOS One* .2013 Apr 18;8(4):e60917. doi: 10.1371/journal.pone.0060917.

{2}-Hassanein M., Al-Arouj M., Hamdy O. et al. Diabetes and Ramadan: practical guidelines. *Diabet. Res. Clin. Pract.* 2017;126:303–316

{3}-Catic T, Jusufovic R. Physician Practice and Knowledge on Diabetes Management During Ramadan in Bosnia and Herzegovina. *Materia Socio-medica*. 2020 Mar;32(1):57-61. DOI: 10.5455/msm.2020.32.57-61.

{4}Tan C, Yong AML, Haji Mohamad MA, Abdul Rahman H, Naing L. Fasting in Ramadan of Muslim patients with diabetes Mellitus, and knowledge and practice in relation to diabetes control in Brunei. *Diabetes Res ClinPract.* 2018 Oct;144:171-176. doi: 10.1016/j.diabres.2018.09.004. Epub 2018 Sep 10. PMID: 30213773.

{5}-El Toony LF, Hamad DA, Omar OM. Outcome of focused pre-Ramadan education on metabolic and glycaemic parameters in patients with type 2 diabetes mellitus. *Diabetes MetabSyndr.* 2018 Sep;12(5):761-767. doi: 10.1016/j.dsx.2018.04.036. Epub 2018 Apr 25. PMID: 29729978.

{6} Al-Agha AE, Kafi SE, Zain Aldeen AM, Khadwardi RH. Flash glucose monitoring system may benefit children and adolescents with type 1 diabetes during fasting at Ramadan. *Saudi Med J.* 2017 Apr;38(4):366-371. doi: 10.15537/smj.2017.4.18750. PMID: 28397942; PMCID: PMC5447188.

{7}-Kaplan W., Afandi B. Blood glucose fluctuation during ramadan fasting in adolescents with type 1 diabetes: findings of continuous glucose monitoring. *Diabet. Care.* 2015

{8}-Lessan N., Hannoun Z., Hasan H., Barakat M.T. Glucose excursions and glycaemic control during Ramadan fasting in diabetic patients: Insights from continuous glucose monitoring (CGM) *Diabet. Metab.* 2015;41:28–36.

{9}-Bailey T, Bode BW, Christiansen MP, Klaff LJ, Alva S. The Performance and Usability of a Factory-Calibrated Flash Glucose Monitoring System. *Diabetes Technol Ther.* 2015 Nov;17(11):787-94. doi: 10.1089/dia.2014.0378. Epub 2015 Jul 14. PMID: 26171659; PMCID: PMC4649725.