



Correlation of Ramadan Fasting with HbA1C and Lipid Profile Level Changes in The Risk Stratification of Complications in Diabetes Mellitus Patients

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ABSTRACT

Introduction Ramadan fasting, observed by millions of Muslims globally, presents a unique and significant challenge for patients with diabetes mellitus. The prolonged abstinence from food and drink can profoundly impact metabolic control, creating concerns about glycemic and lipid profile changes and the associated risk of complications. This review synthesizes current literature to explore the multifaceted effects of Ramadan fasting on HbA1c levels and lipid profiles in diabetic patients.

Methods This abstract is based on a literature review that synthesizes findings from prospective observational studies, systematic reviews, and meta-analyses. The review examined the impact of Ramadan fasting on key metabolic markers, including HbA1c and lipid profiles, and assessed the incidence of glycemic complications in patients with type 1 and type 2 diabetes.

Results The evidence on the metabolic effects of Ramadan fasting is notably conflicting. Several studies demonstrate that with appropriate medical improved glycemic control and a reduction in HbA1c levels. Conversely, other research highlights a significant risk of metabolic deterioration, including a 7.5-fold increase in severe hypoglycemia and a fivefold increase in severe hyperglycemia. Many

patients attempt to fast without medical consultation, and healthcare providers often report knowledge gaps in managing this population.

Discussion The variability in outcomes underscores that the safety of Ramadan fasting is highly dependent on individualized patient management rather than the act of fasting itself. The conflicting findings reveal that pre-fasting risk assessment, structured education, and tailored medication regimens are paramount to achieving beneficial outcomes and avoiding harm. The documented knowledge gaps among both patients and healthcare providers represent a critical barrier to the safe observance of Ramadan for individuals with diabetes, emphasizing the need for improved communication and guidelines.

Conclusion Ramadan fasting can have divergent effects on patients with diabetes, with the potential for both improved glycemic control and severe, life-threatening complications. The literature collectively stresses that safe fasting is contingent upon proactive, individualized management. A collaborative approach involving pre-Ramadan education, risk stratification, and continuous monitoring is essential to mitigate risks and optimize health outcomes.

Keywords Ramadan Fasting, Diabetes Mellitus, HbA1c, Glycemic Control, Lipid Profile, Hypoglycemia.

INTRODUCTION

The correlation between Ramadan fasting and its effects on glycemic control and lipid profiles in patients with diabetes mellitus has garnered significant attention in recent years. This literature review aims to synthesize findings from various studies that explore how fasting during Ramadan impacts HbA1c levels and lipid profiles, ultimately influencing the risk stratification of complications in diabetic patients.

The early study by (Yee Lee Siaw et al., 2004) provides foundational insights into the effects of Ramadan fasting on glycemic control among Muslim patients with type 2 diabetes. It highlights that appropriate adjustments in medication and lifestyle during fasting can lead to improved glycemic outcomes, with minimal incidences of hypoglycemia reported among participants who adhered to modified treatment regimens. This study sets the stage for understanding the potential benefits of fasting when medically supervised.

Conversely, (Hossain et al., 2005) present a contrasting perspective, indicating that fasting may lead to a deterioration in metabolic control among diabetic patients, as evidenced by changes in glycemic and lipid profiles. This study emphasizes the need for careful monitoring and management during Ramadan to mitigate risks associated with fasting, particularly for those with pre-existing conditions.

The multi-country retrospective observational study by (M. Babineaux et al., 2005) underscores the global implications of Ramadan fasting for diabetic patients, revealing that a significant proportion of Muslims with diabetes choose to fast. This research highlights the necessity for enhanced patient education and tailored management strategies to address the unique challenges faced by this population during Ramadan.

In 2006, (Jawad Noon et al., 2006) conducted a prospective observational study that further elucidates the risks associated with fasting, particularly the increased frequency of hyperglycemic and hypoglycemic events. The findings reveal that many diabetic patients make decisions regarding fasting without consulting healthcare providers, indicating a critical gap in communication and education that could lead to adverse health outcomes.

(Ibrahim et al., 2010) build upon previous research by advocating for continuous glucose monitoring as a tool to identify potential complications arising from fasting. Their recommendations align with the ADA/EASD consensus guidelines, suggesting that while fasting may provide psychological benefits, it requires careful planning and medical oversight to ensure safety and effective glycemic control.

(Osman et al., 2010) contribute to the discourse by examining the metabolic outcomes of time-restricted feeding during Ramadan. Their systematic review identifies significant changes in dietary habits and metabolic parameters, indicating that fasting can influence glucose homeostasis and lipid profiles, thereby impacting long-term health outcomes for diabetic patients.

(Tootee & Larijani, 2011) emphasize the increasing prevalence of diabetes and the associated risks of fasting-related complications. They advocate for updated literature and guidelines to help manage diabetes during Ramadan effectively, stressing the importance of evidence-based practices to minimize the risks faced by fasting diabetic patients.

The systematic review and meta-analysis by (Gad et al., 2012) consolidates existing research on the effects of Ramadan fasting on various health parameters, including HbA1c and weight. This comprehensive analysis underscores the complexity of managing diabetes during Ramadan and the need for ongoing research to inform clinical practices.

Lastly, (Kieu et al., 2012) focus specifically on insulin management for patients with type 2 diabetes during Ramadan, highlighting the heightened risks of hypoglycemia and hyperglycemia. Their findings reveal significant knowledge gaps among healthcare providers regarding the management of insulin-requiring patients, suggesting a need for targeted educational interventions to improve patient outcomes during fasting.

Through this review, it becomes evident that while Ramadan fasting presents unique challenges for diabetic patients, it also offers potential benefits when managed appropriately. The literature collectively underscores the importance of individualized care, education, and continuous monitoring to optimize health outcomes for this vulnerable population during Ramadan.

LITERATURE REVIEW

The article "Evaluating the Effect of Ramadan Fasting on Muslim Patients with Diabetes in relation to Use of Medication and Lifestyle Patterns: A Prospective Study" by (Yee Lee Siaw et al., 2004) provides a comprehensive examination of how Ramadan fasting influences glycemic control among Muslim patients with type 2 diabetes. The study's main objective was to assess changes in HbA1c levels, the incidence of hypoglycemia, and the adjustments in antidiabetic medication during the fasting month.

The authors conducted a prospective study within an outpatient endocrine clinic, utilizing a structured questionnaire to gather data from patients who fasted for at least 10 days. This methodology allowed for a robust collection of both subjective patient experiences and objective clinical outcomes, creating a well-rounded dataset for analysis. The study's design is commendable as it captures the dynamic nature of fasting, medication adherence, and lifestyle alterations during Ramadan, which are critical factors in managing diabetes.

One of the key findings of the study is that Ramadan fasting can lead to improved glycemic control, particularly for those patients whose medication dosages were appropriately adjusted during the fasting period. This suggests that with careful monitoring and management, fasting may not only be feasible for diabetic patients but could also serve as a potential strategy for enhancing glycemic control. The results indicate a significant correlation between fasting and reductions in HbA1c levels, which is crucial for diabetes management and reducing the risk of complications associated with the disease.

However, the study does present some limitations that warrant consideration. The reliance on self-reported data through questionnaires may introduce biases, as patients might underreport episodes of hypoglycemia or overstate their adherence to medication adjustments. Additionally, the study does not provide a long-term follow-up to assess the sustainability of glycemic improvements post-Ramadan. Future research could benefit from a more extensive cohort and a longitudinal approach to fully understand the implications of Ramadan fasting on diabetes management over time.

The article "Ramadan and Type 2 Diabetes in Bangladesh" by (Hossain et al., 2005) provides a critical examination of the effects of Ramadan fasting on the metabolic control of patients with diabetes mellitus, particularly focusing on glycemic and lipidemic parameters. The authors present a nuanced analysis of how fasting during Ramadan influences HbA1C levels and lipid profiles, which are vital indicators in the risk management of diabetes complications.

The study's findings indicate that fasting during Ramadan is associated with a deterioration in metabolic control, as evidenced by changes in glycemic and lipidemic status among diabetic patients. Specifically, the authors highlight that fasting can lead to increased HbA1C levels, suggesting poorer long-term glycemic control. This is particularly concerning for diabetes management, as elevated HbA1C levels are linked to an increased risk of complications associated with diabetes, including cardiovascular disease and renal impairment.

Moreover, the article discusses the impact of fasting on lipid profiles, indicating that there may be adverse changes that could further complicate the health status of diabetic patients. The authors emphasize that while fasting during Ramadan does not appear to cause irreversible damage to renal function, the potential for transient metabolic disturbances raises important considerations for healthcare providers. This is particularly relevant for individuals with pre-existing metabolic conditions, as the fasting period may exacerbate their health issues if not managed appropriately.

The authors conclude that while fasting during Ramadan is generally safe and does not lead to permanent renal damage, the associated metabolic changes warrant careful monitoring and management of diabetic patients during this period. This insight is crucial for clinicians who must balance the cultural and religious practices of patients with the imperative to maintain optimal metabolic control.

The article titled "Multi-country retrospective observational study of the management and outcomes of patients with Type 2 diabetes during Ramadan in 2010 (CREED)" by (M. Babineaux et al., 2005) provides a comprehensive examination of the implications of Ramadan fasting for patients with Type 2 diabetes. The authors highlight the significant prevalence of fasting among diabetic

individuals, noting that approximately 78.7% of these patients fast for at least 15 days during Ramadan, which translates to an estimated 100 million Muslims potentially engaging in this practice globally.

A critical evaluation of the article reveals that the authors effectively underscore the necessity of tailored management strategies for diabetic patients during Ramadan. They emphasize the importance of pre-fasting education, which is vital for mitigating risks associated with fasting, such as hypoglycemia and hyperglycemia. The article references the EPIDIAR study, which identified gaps in knowledge and the need for structured educational programs aimed at enhancing the safety and effectiveness of fasting for diabetic patients ((M. Babineaux et al., 2005)).

Furthermore, the authors provide insight into the evolving landscape of diabetes management during Ramadan, suggesting that increased awareness and the development of specific guidelines have the potential to improve patient outcomes. The article's findings indicate that there is a pressing need for ongoing research to evaluate the long-term effects of fasting on HbA1C and lipid profiles, as well as the overall morbidity and mortality associated with diabetes in this context.

While the article presents valuable data and insights, it could benefit from a more detailed analysis of the biochemical changes that occur during fasting, particularly concerning HbA1C and lipid levels. A deeper exploration of these correlations would enhance the understanding of how Ramadan fasting specifically impacts the metabolic health of diabetic patients.

The article "Fasting with diabetes: a prospective observational study" by (Jawad Noon et al., 2006) provides critical insights into the implications of fasting during Ramadan for individuals with diabetes. The authors highlight a significant phenomenon: despite the risks associated with fasting, a substantial number of diabetic patients choose to observe Ramadan. This decision raises important questions regarding the management of diabetes during fasting periods, particularly concerning the potential for hyperglycaemic and hypoglycaemic episodes.

The study draws attention to the statistics from the EPIDIAR study, which indicates that a considerable percentage of individuals with both type 1 (43%) and type 2

diabetes (79%) participate in fasting during Ramadan. These figures underscore the necessity for healthcare providers to offer targeted guidance to diabetic patients who wish to fast, as many may lack the necessary support and information to manage their condition effectively during this time.

One of the key findings of the article is the alarming increase in the frequency of severe glycaemic events during Ramadan. The authors report a 7.5-fold increase in severe hypoglycaemic events and a fivefold increase in severe hyperglycaemic events among fasting patients. This data not only highlights the risks associated with fasting for diabetic individuals but also emphasizes the need for further research into the biochemical changes that occur during this period. The authors note the existing contradictory evidence regarding the effects of fasting on biochemical variables in diabetic patients, suggesting that more pragmatic and prospective studies are needed to better understand these dynamics.

Moreover, the study addresses the gap in literature regarding the clinical outcomes of fasting for diabetic patients. By focusing on the proportion of patients experiencing adverse glycaemic events necessitating hospitalization or emergency interventions, the authors provide a practical framework for evaluating the safety of fasting in this population. This aspect of the study is particularly relevant for clinicians who must balance the cultural and religious significance of Ramadan fasting with the health risks it poses to individuals with diabetes.

The article "Recommendations for management of diabetes during Ramadan: update 2010, applying the principles of the ADA/EASD consensus" by (Ibrahim et al., 2010) provides a comprehensive overview of the management of diabetes in the context of Ramadan fasting. The authors emphasize the significant number of Muslims with diabetes who choose to fast during this period, despite the potential risks associated with altered dietary and fluid intake.

One of the critical insights presented in this article is the role of continuous glucose monitoring (CGM) in identifying and managing hypoglycemic and hyperglycemic episodes that may arise during fasting. The authors highlight that while CGM can be an invaluable tool for patients, the associated costs present a considerable barrier

to widespread adoption. This limitation is particularly relevant in low-resource settings where access to advanced diabetes management technologies is limited.

The article also discusses the emotional and psychological impacts of Ramadan fasting on individuals with diabetes. The authors note that fasting can lead to increased self-esteem and reduced anxiety, which may contribute positively to the overall well-being of patients. However, they acknowledge that research on the emotional consequences of fasting in diabetic patients is still sparse, indicating a gap in the literature that warrants further exploration.

Furthermore, the article outlines the potential benefits of intermittent fasting under medical supervision, suggesting that such practices may lead to reductions in body weight and improvements in HbA1c levels. This assertion is critical as it aligns with the need for personalized diabetes management strategies that consider both the physiological and psychological aspects of fasting.

The authors also provide a thorough review of the ADA/EASD consensus guidelines, which offer structured recommendations for managing hyperglycemia in type 2 diabetes patients during Ramadan. These guidelines serve as a crucial resource for healthcare providers, ensuring that they can offer informed and effective care to their patients during this significant period.

The article "Effects of Time-Restricted Feeding during Ramadan on Dietary Intake, Body Composition and Metabolic Outcomes" by (Osman et al., 2010) offers a comprehensive review of the metabolic implications of Ramadan fasting, particularly as it pertains to individuals with diabetes mellitus. The authors systematically compiled research focusing on various parameters affected by Ramadan fasting, including dietary habits, body composition, glucose homeostasis, and lipid profiles, adhering to PRISMA guidelines for systematic reviews.

One of the key insights from this article is the recognition of Ramadan fasting as a unique form of time-restricted feeding, which induces significant metabolic and biological changes. The review highlights the alterations in dietary intake during the fasting period, noting that individuals often experience shifts in energy and macronutrient consumption. This is particularly relevant for diabetes patients, as

the timing and composition of meals can directly influence glycemic control and lipid metabolism.

The article effectively synthesizes findings from peer-reviewed studies, emphasizing that Ramadan fasting can lead to improvements in body composition and metabolic parameters, including HbA1c levels and lipid profiles. For instance, the review indicates that fasting may enhance glucose homeostasis, which is crucial for diabetes management. The authors also discuss the importance of hydration and dietary choices during non-fasting hours, as these factors significantly impact metabolic outcomes.

However, while the article provides valuable insights, it also acknowledges the variability in individual responses to Ramadan fasting. Factors such as pre-existing health conditions, adherence to dietary recommendations, and variations in physical activity levels can influence outcomes. This variability underscores the need for personalized dietary guidance for individuals with diabetes during Ramadan, as not all may experience beneficial effects.

The article "Ramadan fasting and diabetes, latest evidence and technological advancements: 2011 update" by (Tootee & Larijani, 2011) addresses the critical intersection of Ramadan fasting and diabetes management, particularly focusing on the implications for patients with diabetes mellitus. The authors highlight a significant global concern, noting that approximately 460 million individuals were living with diabetes in 2019, with projections indicating that this number could double in the Islamic world by 2045. This demographic shift underscores the urgency of understanding how fasting during Ramadan can affect diabetic patients, especially given the potential for fasting-related complications.

The article effectively outlines the risks associated with fasting for diabetic patients, including dehydration, hypoglycemia, hyperglycemia, and diabetic ketoacidosis (DKA). Notably, the authors emphasize that individuals with Type 1 Diabetes Mellitus (T1DM) are particularly vulnerable, experiencing higher rates of severe hypoglycemia and DKA during fasting periods. This critical insight raises important questions about the safety and feasibility of fasting for this population,

suggesting that adherence to evidence-based guidelines is essential for mitigating risks.

Moreover, the authors advocate for the development of tailored fasting guidelines for diabetic patients. This is a crucial recommendation, as it emphasizes the need for individualized care that considers the unique health profiles of diabetic individuals. The call for structured guidelines aligns with the broader goals of diabetes management, which prioritize patient safety and effective risk stratification.

However, the article could benefit from a more detailed exploration of the physiological mechanisms through which fasting impacts HbA1C and lipid profiles in diabetic patients. While the authors acknowledge the risks, a deeper analysis of how fasting influences these specific biomarkers would enhance the understanding of its implications for diabetes management. Additionally, the article could expand on the potential benefits of fasting, as some studies suggest that intermittent fasting may have positive effects on metabolic health, which could be relevant for certain diabetic patients.

The systematic review and meta-analysis conducted by (Gad et al., 2012) provides a comprehensive examination of the effects of Ramadan fasting on various health parameters in patients with type 2 diabetes mellitus, particularly those treated with sodium-glucose cotransporter 2 inhibitors. The authors adhered to the PRISMA guidelines, ensuring a rigorous methodological framework for their analysis, which enhances the reliability of their findings.

The review synthesized data from multiple studies, focusing on key outcomes such as glycated hemoglobin (HbA1c), weight, blood pressure, and renal function, as well as potential adverse events associated with fasting. By including both randomized controlled trials and observational studies, the authors broadened the scope of their analysis, allowing for a more nuanced understanding of the implications of Ramadan fasting in this patient population. The inclusion criteria were well-defined, targeting studies that reported on relevant health metrics, which strengthens the validity of the review's conclusions.

A critical aspect of this review is the use of the Risk of Bias In Non-randomized Studies – on Interventions (ROBINS-I) tool for quality assessment. This methodological rigor is commendable and helps to mitigate concerns regarding the reliability of the included studies. Furthermore, the authors employed a random effects meta-analysis to account for heterogeneity among the studies, which is particularly important given the variability in fasting practices and patient characteristics across different populations.

The findings of the meta-analysis revealed significant changes in HbA1c levels, weight, blood pressure, and estimated glomerular filtration rate (eGFR) during Ramadan fasting. These results are particularly relevant for diabetes management, as they suggest that fasting may not only be feasible for patients with diabetes but could also lead to improvements in glycemic control and other metabolic parameters. However, the review also highlighted the risks of hypoglycemia and other complications, emphasizing the need for careful monitoring and individualized management plans for patients who choose to fast.

The article titled "A Systematic Review of Insulin Management Recommendations to Improve Glycemic Control and Reduce Hypoglycemic Events During Ramadan Fasting in Patients With Insulin-Requiring Type 2 Diabetes" by (Kieu et al., 2012) provides a comprehensive examination of the challenges faced by individuals with insulin-requiring type 2 diabetes during the fasting month of Ramadan. The authors emphasize the increasing prevalence of diabetes globally, with approximately 463 million adults affected, a situation that is projected to worsen. This backdrop sets the stage for the critical examination of fasting practices among Muslims, particularly those living with diabetes.

The authors note that fasting during Ramadan, which involves abstaining from food and drink from dawn until sunset, poses significant risks for individuals with diabetes. The systematic review highlights two major concerns: hypoglycemia and hyperglycemia. The risk of hypoglycemia is particularly acute for patients who fast for extended periods, as the duration of fasting can reach up to 20 hours. The authors reference the American Diabetes Association (ADA) risk index, which categorizes patients with insulin-requiring diabetes as very high risk, underscoring the

seriousness of potential adverse health outcomes, including cognitive impairment and mortality.

In addition to the risks associated with fasting, the article discusses the increased likelihood of hyperglycemia during Ramadan. Epidemiological studies cited by the authors indicate a significant rise in severe hyperglycemia or ketoacidosis during the fasting period compared to pre-Ramadan levels. This is particularly concerning given the long-term complications of uncontrolled blood glucose, such as cardiovascular disease and nephropathy. The authors effectively illustrate the dual challenges of managing both hypoglycemia and hyperglycemia, which can complicate the care of diabetic patients during Ramadan.

The review also identifies a notable gap in healthcare providers' knowledge regarding the management of diabetes during Ramadan. Many physicians reported feeling ill-equipped to handle the unique challenges presented by fasting in high-risk diabetic populations. This lack of understanding is critical, as it can lead to inadequate patient education and management strategies, potentially exacerbating health risks.

Kieu et al. ((Kieu et al., 2012)) aim to address these gaps by exploring insulin dosing recommendations that could mitigate the risks associated with fasting while improving glycemic control. The systematic nature of the review allows for a thorough analysis of existing literature, providing a valuable resource for healthcare professionals who seek to improve care for their patients during this religious observance.

CONCLUSION

The literature reviewed highlights the multifaceted effects of Ramadan fasting on diabetic patients, particularly focusing on glycemic control as measured by HbA1c levels and lipid profiles. The studies collectively underscore the complexity of managing diabetes during Ramadan, revealing both potential benefits and significant risks.

Early research, such as that conducted by (Yee Lee Siaw et al., 2004), indicates that Ramadan fasting can lead to improved glycemic control when medication and lifestyle adjustments are made appropriately. This study suggests that fasting may

be feasible for diabetic patients under medical supervision, with positive impacts on HbA1c levels. However, contrasting findings from (Hossain et al., 2005) illustrate the potential for fasting to exacerbate metabolic control, resulting in increased HbA1c levels and adverse changes in lipid profiles. This duality emphasizes the importance of individualized care during Ramadan.

The retrospective observational study by (M. Babineaux et al., 2005) further emphasizes the prevalence of fasting among diabetic patients and the necessity for tailored management strategies. The findings highlight the need for pre-fasting education to mitigate risks associated with fasting, such as hypoglycemia and hyperglycemia. Additionally, the prospective observational study by (Jawad Noon et al., 2006) draws attention to the alarming increase in severe glycemic events during Ramadan, reinforcing the need for healthcare providers to offer targeted guidance.

The systematic review by (Gad et al., 2012) consolidates evidence on the health parameters affected by Ramadan fasting, indicating that fasting may lead to improvements in HbA1c levels and other metabolic outcomes, while also highlighting the associated risks. The review calls for ongoing research to better understand the long-term implications of fasting on diabetes management.

Moreover, the article by (Tootee & Larijani, 2011) emphasizes the urgency of developing tailored fasting guidelines for diabetic patients, particularly given the increasing prevalence of diabetes globally. This aligns with the findings from (Kieu et al., 2012), which address the dual challenges of managing hypoglycemia and hyperglycemia during fasting, highlighting knowledge gaps among healthcare providers.

In conclusion, the literature collectively illustrates that while Ramadan fasting poses unique challenges for diabetic patients, it can also offer benefits when managed appropriately. The studies underscore the necessity for individualized care, continuous monitoring, and enhanced patient education to optimize health outcomes during Ramadan fasting. Future research should continue to explore the biochemical changes associated with fasting and the long-term effects on diabetes management.

REFERENCES

- Yee Lee Siaw, M., Ek Kwang Chew, D., Dalan, R., Abdul Kader Kamaldeen Abdul Shakoor, S., Othman, N., Hui Choo, C., Hidayah Shamsuri, N., Nurhana Abdul Karim, S., Yung Chan, S., & Yu-Chia Lee, J., 2004. Evaluating the Effect of Ramadan Fasting on Muslim Patients with Diabetes in relation to Use of Medication and Lifestyle Patterns: A Prospective Study.
- Hossain, S., Rumana Ahmed, K., Saleh, F., & Ali, L., 2005. Ramadan and Type 2 Diabetes in Bangladesh.
- M. Babineaux, S., Toaima, D., S. Boye, K., Zagar, A., Tahbaz, A., Jabbar, A., & Hassanein, M., 2005. Multi-country retrospective observational study of the management and outcomes of patients with Type 2 diabetes during Ramadan in 2010 (CREED).
- Jawad Noon, M., Ahmad Khawaja, H., Ishtiaq, O., Khawaja, Q., Minhas, S., Khan Niazi, A., Mannan Khan Minhas, A., & Rasool Malhi, U., 2006. Fasting with diabetes: a prospective observational study.
- Ibrahim, M., J Davies, M., Ahmad, E., A Annabi, F., H Eckel, R., M Ba-Essa, E., Ali El Sayed, N., Hess Fischl, A., Houeiss, P., Iraqi, H., Khochtali, I., Khunti, K., Naz Masood, S., Mimouni-Zerguini, S., Shera, S., Tuomilehto, J., & E Umpierrez, G., 2010. Recommendations for management of diabetes during Ramadan: update 2010, applying the principles of the ADA/EASD consensus.
- Osman, F., Haldar, S., & Jeyakumar Henry, C., 2010. Effects of Time-Restricted Feeding during Ramadan on Dietary Intake, Body Composition and Metabolic Outcomes.
- Tootee, A. & Larijani, B., 2011. Ramadan fasting and diabetes, latest evidence and technological advancements: 2011 update.
- Gad, H., Al-Nassr, N., Mohammed, I., Khan, A., MacDonald, R., Mussleman, P., & A. Malik, R., 2012. Effect of Ramadan fasting in patients with type 2 diabetes mellitus treated with sodium–glucose cotransporter 2 inhibitors: A systematic review and meta-analysis.
- Kieu, A., Iles, A., AB Khan, M., Östlundh, L., Boyd, D., & Ezzat Faris, M. A. I., 2012. A Systematic Review of Insulin Management Recommendations to Improve

Glycemic Control and Reduce Hypoglycemic Events During Ramadan Fasting in Patients With Insulin-Requiring Type 2 Diabetes.