

## Research Article

### Ramadan-Specific Diabetes Management – A Quasi-Experimental Study to Assess the Knowledge among Doctors

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#### Abstract |

**Objective:** To determine knowledge about Ramadan-specific diabetes management among resident doctors (RDs) working on medical floor through pre-post lecture format and to assess effectiveness of targeted educational activity.

**Methods:** This study was conducted in Department of Medicine, King Edward Medical University, Lahore during May 2016. 82 RDs including house officers (HOs) and postgraduate residents (PGRs) working on the medical floor participated in the study. A self-designed 30-item questionnaire based on American Diabetes Association guidelines for management of diabetes during Ramadan was self-administered before and after a lecture on the same topic. Pre and post-scores and improvement after session was calculated for each group of RDs. Mann-Whitney & Wilcoxin signed ranks tests were used to assess differences in pre and post scores and for improvement in knowledge. p-value <0.05 was considered significant.

**Results:** A total of 82 RDs including 44(53.66%) HOs & 38 (46.34%) PGRs participated in the study. At baseline, mean scores were 54.1% (±14.53) for HOs & 69.12% (±12.01) for PGRs (p-value 0.000) with lowest subscores for alarming blood sugar level category for both groups. Significant increase (p-value <0.05) in level of knowledge was seen after the lecture in both groups. HOs showed slightly higher absolute improvement than PGRs (45.05% vs 37.39% respectively). However, the relative improvement was significantly higher for PGRs (46.92%) than for HOs (36.82%) with p-value 0.028.

**Conclusion:** Baseline knowledge of resident doctors regarding management of fasting diabetic patients is suboptimal but can be enhanced through targeted sessions. PGRs are more receptive to educational programs than their junior colleagues.

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**Keywords** | Diabetes management, Ramadan fasting, Resident doctors, Educational activity.

#### Introduction

Diabetes mellitus is a metabolic disorder characterized by high blood glucose due to either insulin deficiency or insulin resistance.<sup>(1)</sup> Among the estimated 285 million diabetics in the world, nearly 50 million diabetic Muslims observe fast from

sunrise to sunset during the lunar month of Ramadan every year.<sup>(1,2,3)</sup> Ramadan fasting is one of the five religious essentials for all healthy adult Muslims.<sup>(2,3)</sup> Should the diabetics be considered healthy enough to fast?<sup>(4)</sup> This foremost question relates to the prerequisite of this religious rite that fast is “fard” for

only the healthy while the sick are exempt.<sup>(4)</sup>

The month of Ramadan follows the lunar calendar and over time Ramadan falls in different seasons. The duration of fast during the summer months often exceeds 15 hours and the patient is unable to take small frequent meals which are routinely prescribed to the diabetics for management of their disorder in addition to pharmacologic therapy.<sup>(5)</sup> The physicians' role here expands beyond standard advice to preventing complications and help making Ramadan-fasting safer for their patients.<sup>(6)</sup> American Diabetes Association (ADA) has published guidelines to address these questions.<sup>(6)</sup> However, formal teaching of this issue, though vital for all the physicians involved in treatment of Muslim patients, is not consistently carried out on the medical floor either at the undergraduate or the postgraduate level resulting in insufficient delivery of Ramadan-specific diabetes knowledge to patients as well.<sup>(7)</sup>

In Pakistan, nearly 96.4% of the population is Muslim and reportedly 73% of the diabetic population observes Ramadan-fasting for an average of 20-25 days during the month including both type 1 and type 2 diabetics.<sup>(8)</sup> EPIDIAR study which included 12,914 patient from 13 Muslim countries also showed that 43% type 1 and 79% type 2 diabetics fasted during Ramadan.<sup>(2)</sup> The rate of hypoglycemia in previous studies was reported to vary between 4 and 18%.<sup>(8,9)</sup> Self monitoring of glucose as well as breaking the fast in the event of hypoglycemia were not routinely practiced by diabetic patients.<sup>(8)</sup>

It has been recommended that Muslim diabetic patients who wish to fast should be educated periodically by their respective health care providers to ensure safe Ramadan fasting.<sup>(10)</sup> Previous studies have assessed the knowledge of the diabetic patients regarding safety of Ramadan-fasting,<sup>(7)</sup> and a recent study targeted primary care providers to assess their knowledge and ease in managing diabetic patients during Ramadan.

This interesting and clinically relevant subject was introduced to the resident doctors (RDs) working on the medical floor during an educational session with the objectives being: (a) to assess the baseline (pre-lecture) level of knowledge of doctor regarding safe Ramadan-fasting and to improve patient care in this

regard by enhancing the knowledge of resident doctors and (b) to assess the impact and effectiveness of a targeted educational activity. This study reports pre and post lecture results for knowledge of two groups of resident doctors working on the medical floor in a tertiary care teaching hospital who attended an educational session about management of diabetic practicing Ramadan-fasting.

## Methods

This quasi-experimental study was conducted over 2 weeks during May 2016 in the department of Medicine, Mayo Hospital, Lahore. Mayo Hospital is a leading tertiary care, teaching hospital in public sector of Pakistan and is affiliated with King Edward Medical University which is the oldest medical institution in the country and is conducting undergraduate and postgraduate medical programs.

RD working on the medical floor in Mayo Hospital, Lahore were invited to attend an educational session and participate in the study. Among the 82 willing doctors, there were 44 house officers (HOs) who had graduated from medical college within last 12 months and were undergoing foundation year training while the remainder were post-graduate residents (PGRs) enrolled in various post-graduate degree and diploma programs in the specialty of internal medicine. RDs who had previously attended a lecture, seminar or conference on management of diabetes.

After approval from the institutional review board, 2 educational sessions consisting of 30 min lecture and 30 min question and answer session were held. The lecture was based on the updated American Diabetes Association (ADA) recommendations for management of diabetes during Ramadan and was delivered by the researchers themselves through a microsoft office power point presentation to maintain uniformity between the sessions. The lecture focused on the role of physicians in making Ramadan-fasting safe for diabetic patients and focused on the following themes: a) risk groups of patients willing to fast, b) checking blood sugar level and use of insulin, c) lifestyle modifications during fasting period including exercise & dietary advice, d) prescription & modification of anti-diabetic drugs including Insulin, e) risks associated with fasting and f) actions in case of diabetic emergencies. Finally, questions were

invited to clarify any ambiguities regarding the topic.

A 30-item questionnaire was self-designed and was based on ADA recommendations for safe Ramadan fasting and tested the knowledge about the same key points in management of diabetic patients as were addressed in the lecture. The questionnaire was pretested on a group of 20 doctors including 10 HOs & 10 PGRs and some of the questions were modified to ensure clarity.

The study tool tested various aspects of Ramadan-specific knowledge of RDs. The first of these aspects was identification of high and low risk diabetics and then was the validity/breaking of fast by injecting insulin and checking blood sugar level (BSL). Lifestyle modifications and choice and adjustment of antidiabetic medications (oral & injectables) were addressed next. This was followed by questions about the risks of fasting in diabetic patients and the alarming BSL levels at which fast should be broken and the doctor should be consulted.

After signing the consent form, the questionnaire was self administered twice i.e., 10 minutes before the lecture and immediately after the lecture. Complete anonymity was ensured.

Data were entered in Statistical Package for the Social Sciences (SPSS) for analysis and was stratified for designation. There was only one correct answer to each of the 30 questions and each correct answer contributed by one mark thereby providing a maximum possible score was 30. The total scores (absolute and as percentage) were calculated twice, i.e., pre-lecture and post-lecture.

Normality of data was investigated by Z-values of skewness & kurtosis, using Shapiro-Wilk's test and visual inspection of histograms, normal Q-Q plots and box plots of the scores obtained. The difference between scores of PGR's and HO's at baseline was compared by Mann-Whitney test for non-parametric data. Wilcoxin signed ranks test was used to assess the differences in the scores on the two occasions (pre- and post-lecture) for each group of RDs.

The absolute improvement in the score of each doctor was calculated as (pre-lecture score/post-lecture score)/30 X100. To nullify the effect of room for progress, the relative improvement was calculated as (absolute improvement/room for progress) X 100. Both of these parameters were expressed as percen-

tages and were compared across the groups of RDs by Mann-Whitney test. p-value <0.05 was considered significant for all the analysis conducted.

## Results

A total of 82 RDs including 44 (53.66%) HOs & 38 (46.34%) PGRs working on the medical floor of our hospital participated in the study. Shapiro-Wilk's test (p-value <0.05) and a visual inspection of their histograms, normal Q-Q plots and box plots of the scores showed that the pre-lecture scores were not normally distributed for both HOs & PGRs, thereby necessitating the use of non-parameteric tests for comparison.

The mean scores for the two groups of RDs before the lecture are shown in Table 1. The PGRs scored higher at the baseline than the HOs in all aspects and the differences were statistically significant according to Mann-Whitney Test (p-value <0.05).

An increase in level of knowledge was seen after the lecture in both the groups and this difference was shown to be statistically significant (p-values <0.05)

**Table 1:** Comparison of Pre-Lecture Scores of House Officers & Post-Graduate Residents

Parameters	Mean Score $\pm$ SD (as Percentage)		P-value
	House Officers	Post-Graduate Residents	
Risk Group Identification	66.36 $\pm$ 23.93	74.74 $\pm$ 20.63	0.072
Perception about Needle Use	61.36 $\pm$ 30.24	73.68 $\pm$ 38.1	0.020
Exercise Recommendation	71.21 $\pm$ 18.46	87.71 $\pm$ 22.49	0.000
Diet Recommendation	54.55 $\pm$ 28.16	73.68 $\pm$ 19.23	0.000
Choice of Medicines	41.67 $\pm$ 27.26	62.28 $\pm$ 25.61	0.000
Adjustment of Medicines	56.82 $\pm$ 31.61	60.53 $\pm$ 31.1	0.324
Possible Complications	53.03 $\pm$ 22.52	78.94 $\pm$ 22.49	0.000
Alarming BSR Levels	27.27 $\pm$ 36.5	13.16 $\pm$ 22.31	0.046
Overall Score	54.1 $\pm$ 14.53	69.12 $\pm$ 12.01	0.000

\*Standard Deviation (SD)

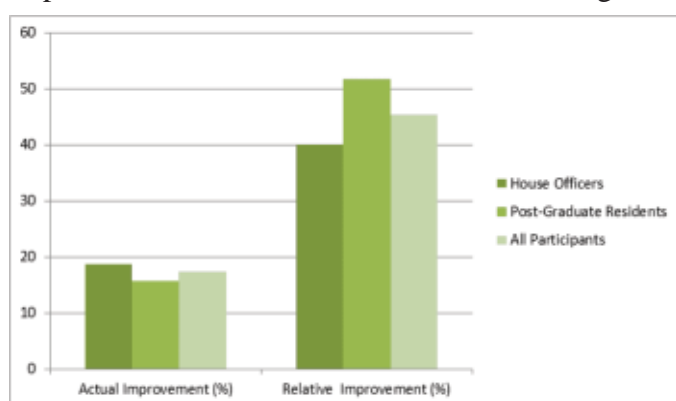
**Table 2:** Comparison of Pre-Lecture & Post-Lecture Score of House Officers & Post-Graduate Residents

Parameters	House Officers			Post-Graduate Residents		
	Pre-Lecture Mean Score $\pm$ SD (%)	Post-Lecture Mean Score $\pm$ SD (%)	p-value	Pre-Lecture Mean Score $\pm$ SD (%)	Post-Lecture Mean Score $\pm$ SD (%)	p-value
<b>Risk Group Identification</b>	66.36 $\pm$ 23.93	77.27 $\pm$ 15.31	0.005	74.74 $\pm$ 20.63	82.11 $\pm$ 19.61	0.008
<b>Perception about Needle use</b>	61.36 $\pm$ 30.24	81.82 $\pm$ 28.71	0.001	73.68 $\pm$ 38.1	89.47 $\pm$ 31.10	0.001
<b>Exercise Recommendation</b>	71.21 $\pm$ 18.46	84.85 $\pm$ 30.03	0.020	87.71 $\pm$ 22.49	84.21 $\pm$ 20.12	0.202
<b>Diet Recommendation</b>	54.55 $\pm$ 28.16	62.5 $\pm$ 30.26	0.048	73.68 $\pm$ 19.23	85.53 $\pm$ 31.1	0.007
<b>Choice of Medicines</b>	41.67 $\pm$ 27.26	77.27 $\pm$ 30.73	0.000	62.28 $\pm$ 25.61	87.72 $\pm$ 17.19	0.000
<b>Adjustment of Medicines</b>	56.82 $\pm$ 31.61	68.18 $\pm$ 32.51	0.033	60.53 $\pm$ 31.1	73.68 $\pm$ 34.36	0.000
<b>Possible Complications</b>	53.03 $\pm$ 22.52	66.67 $\pm$ 26.41	0.001	78.94 $\pm$ 22.49	91.22 $\pm$ 10.06	0.001
<b>Alarming BSL Levels</b>	27.27 $\pm$ 36.5	65.91 $\pm$ 41.44	0.000	13.16 $\pm$ 22.31	71.05 $\pm$ 37.9	0.000
<b>Overall Score</b>	54.1 $\pm$ 14.53	72.88 $\pm$ 15.09	0.000	69.12 $\pm$ 12.01	84.91 $\pm$ 11.57	0.000

\*Standard Deviation (SD)

within each group by using Wilcoxin signed ranks test. The mean scores for each category of questions as well as the total scores were higher for the PGRs than the HOs. (Table 2)

The HOs showed a slightly higher absolute improvement than the PGRs (45.05% vs 37.39% respectively). However, after correcting for the possible room of progress, the relative improvement was significantly higher for the PGRs (46.92%) than for the HOs (36.82%) with a p-value of 0.028. The impact of the educational session is shown in Figure 1.



**Figure 1:** Impact of the Educational Session in Terms of Absolute & Relative Improvement Shown by House Officers, Post-Graduate Residents & The Study Group as whole

## Discussion

Physicians often face a dilemma when the question:

“May I fast, doctor?” is put forward by a diabetic patient under their care.<sup>(10)</sup> Although Islam exempts sick people from fasting,<sup>(12)</sup> many Muslims with diabetes may not perceive themselves as sick and are keen to fast.<sup>10</sup> The answers to these questions lie only in precise knowledge of the principles behind safe Ramadan-fasting. ADA has issued guidelines to help address these questions<sup>(6)</sup> and this study attempted to assess the knowledge of doctors in this regard.

The assessment of practical issues in management of fasting diabetics was directed towards resident doctors in a pre-lecture/post-lecture format. The HOs obtained lower scores than PGRs in almost all aspects of diabetes care in both the assessment sessions. These results were expected given that HOs are recent graduates and have less experience and clinical exposure. Moreover, during their foundation year, most of the HOs have still not selected their field for further study and may not be as committed to the discipline of Internal Medicine as their senior colleagues. Lifestyle modifications (especially recommended diet), use of anti-diabetic medications, the possible complications that can arise in fasting diabetic patients and the knowledge of threatening BSRs were the most deficient aspects.

There were also some surprises in the PGRs' results as well; the insufficient knowledge of alarming BSRs was itself quite alarming. These red-flag values have been specified so as to make Ramadan-fasting safe.



One must break the fast and immediately consult his doctor to avoid life-threatening complications including hypoglycemia, diabetic ketoacidosis and hyperosmolar non-ketotic coma. It is the prime responsibility of treating physicians to keep themselves abreast of the current guidelines that help make a patient's life safe. These results, though worrisome, are not isolated. Various studies have reported the limitations of human minds in medical decision making as explanation for practice disparities, delay, errors, and ultimately unfavorable outcomes.<sup>(13,14,15)</sup>

The study pointed out various important shortcomings in the knowledge of the participating doctors. 79.27% doctors had erroneous notions regarding the BSRs requiring urgent action. 34.96% failed to realize the potential complications in fasting diabetic patients in the baseline assessment while 36.59% doctors advocated a potentially harmful diet. The principles of management in these aspects are no different from those of non-fasting diabetes. Previously, questions have been raised whether doctors should be the ones to provide nutrition and lifestyle counseling as their knowledge in this regard remains commonly inadequate.<sup>(16,17)</sup> Lack of time, patient noncompliance, inadequate teaching materials, lack of counseling, training, lack of knowledge are some of the barriers to inadequate lifestyle counseling by physicians.<sup>(18)</sup> It remains unclear whether there was a fundamental deficiency in understanding the pathophysiology of diabetes or if the RDs in the present study perceived that there are different homeostatic mechanisms in play during fast.

The choice of medicine as well as the dosage and timing adjustment is a relatively specialized field and the residents in this study acquired low scores in the pre-lecture test. There was much apprehension about the use of insulin and insulin secretagogues at pre-dawn meal with the underlying belief that their use will result in hypoglycemic episodes. The rise in post-lecture scores in these aspects revealed that a better awareness of the underlying mechanisms was imparted to the participating group. Many researchers have focused their attention to finding of anti-diabetic drugs and regimes deemed safe during Ramadan-fasting.<sup>(2,19,20,21,22,23)</sup> As the data pools, much better protocols can be designed.

An important question is whether these deficiencies translate into inefficient patient care. Salti et al collected data from 13 countries and reported less than 50% of the fasting diabetics modified their treatment regimes (oral anti-diabetic drugs and insulin) and severe hypoglycemic episodes were

significantly more frequent during Ramadan than other months.<sup>(2)</sup> Additionally, it was seen that severe hypoglycemia was more common in patients whose drug regimes were modified.<sup>(2)</sup> Conversely, Ahmedi et al demonstrated that patient education and counseling along with frequent glucose monitoring and alteration in drug dosage and schedule are the key to better outcomes in diabetic patients who observe Ramadan fasting.<sup>(19)</sup> These previous studies, however, did not assess the adequacy of physicians' knowledge.

As the baseline knowledge was significantly different among the participating groups in our study, so further testing between the groups was refrained from and only within-group pre-post analysis was done. All the aspects of management of diabetes during Ramadan-fasting showed significant rise in scores. This finding was consistent for both our study groups hence highlighting the value of the brief seminar. Previous studies have also reported the efficiency of conducting short seminars and lectures for target audience and these effects have been observed regardless of the study topic.<sup>(24,25)</sup>

The HOs showed slightly greater improvement in their knowledge than the PGRs but the relative improvement, which nullified the effect of possible room for progress, was significantly greater among the PGR group. This indicates that although the HO benefit from such concise and targeted activities but these seemingly greater benefits derive from their basic deficiency of awareness. The PGRs, on the other hand, are more committed to learn and improve upon their shortcomings. The possible reasons could be the differences in their expertise as well as better comprehension abilities. However, exploration of these reasons is beyond the scope of the present study. The study had some limitations. The validity and reliability of the feedback form may be questioned as it was self-designed and never used before. The questionnaire had been pretested to modify any ambiguous and confusing questions. It tested for management themes rather than any case scenarios. The study does not assess the religious inclinations and beliefs of the participating doctors which may have affected their responses. There was also no follow up testing to assess the retention of the content discussed.

## Conclusion

In conclusion, this study points out that the baseline knowledge of resident doctors regarding management of fasting diabetic patients is suboptimal but can

be enhanced through targeted educational activities. It also demonstrates that PGRs are more receptive to educational programs and have more positive results than their junior colleagues.

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**Conflict of Interest: None**

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