

Effect of Ramadan Fasting on Cognitive Function of Physicians

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Abstract

Introduction: Effect of fasting on human cognition has been a topic of recent research. The results of those studies are contradictory at best. Moreover, fasting as a religious ritual for an entire holy month of Ramadan has many denominators that differs from other pattern of fasting. Data on cognitive functions of physicians during Ramadan is scarce. We had investigated the effect of Ramadan fasting on physicians who are actively engaged in treating patients.

Materials and Methods: This was a cross-sectional study conducted on 53 doctors working in a teaching hospital. Basic and task specific data were collected 1 week before and during Ramadan. On each occasion, cognition of each participant was tested using Trail making Test (TMT) part A and B, Simple reaction time (SRT) and Stroop test. Independent and paired t-test and multiple regression analysis were used for statistical analysis of Data in SPSS with significance level set at 0.05 or lower. **Result:** Overall, Ramadan fasting had no significant impact on cognitive capabilities of the physicians. Female participants (67.9%) performed better in TMT A and B and increased age was related to poorer results in SRT, TMT A and B. Higher diastolic blood pressure was associated with higher TMT B score. Neither sleep nor the blood glucose had any significant impact on cognition during Ramadan. **Conclusion:** In our study we had found no impairment of cognitive functions of treating physicians from different age group and specialties due the religious fasting on the holy month of Ramadan.

Key-words: Physicians, Fasting, Cognition, reaction time, trail making test.

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Introduction:

Cognition is a key component of the supremacy of human being as it enables us to learn and adopt. It is the process of acquiring, processing, organizing, planning and executing of the information. A more tangible way of thinking about cognition is to define it in terms of learning, memory and functioning. Without this incredible process, we would not have achieved our fit in the hierarchy of life on this planet. Cognition

affects every human endeavor and the process of cognition can get affected by different factors. Some common examples of that can be hunger¹, thirst², sleep deprivation³, any disease that can cause cognitive decline like stroke, dementia etc. Professions that demand sound cognitive ability includes physician. As physicians deals with the complexities of disease process, anything that negatively affect their cognition may have the potential to impart detrimental effect on patients' healthcare. Muslims restrain themselves from eating and drinking from dawn to dusk for a whole month of Ramadan as their religious obligation. Staying awake late at night for rituals is a common practice too. Moreover, to have the pre-fast meal known as "Sahur", normal sleep-wake cycle is disrupted⁴ which can also affect cognitive performance⁵. Studies on fasting for reasons other than Ramadan had shown to have a negative impact on cognition⁶. Fasting during Ramadan has many features that set it apart from other types of calorie restricted diets in practice like the complete abstinence from food as well as drink, variable time frame, disrupted circadian rhythm and pre-dawn meal. Research on effect of Ramadan fasting on cognition had revealed mixed results. Some studies had shown that, some aspects of cognitive function like working memory, visual learning, reaction time etc. may remain relatively preserved⁷ while rapid reaction, detection and identification of elements may get affected⁸. Another interesting finding was a decline in reaction time among male athletes at the beginning of Ramadan which gradually improved in the later days of fasting⁹. The previous studies were conducted on healthy subjects of different age and group, especially athletes, female, school going kids and medical students. To the best of our knowledge, no study was ever conducted in Bangladesh to investigate the possible effect of Ramadan fasting on the cognition of physicians who are directly involved in treating patients. Our study aimed to explore whether any such relationship between fasting and cognition exist or not among physicians.

Materials and Methods:

This was a cross-sectional study. The study was conducted between February to April 2025 at Ad-din Sakina Women's Medical College Hospital, a tertiary level teaching hospital in southern Bangladesh. 56 participants were enrolled in the study based on non-probability sampling but later on 3 participants opted out of the study due their health issue at the time of data collection during Ramadan. Inclusion criteria were 1) Doctors who are involved in direct patient care 2) Muslim doctors who fast during Ramadan. Exclusion criteria were: 1) Any chronic background illness likely to impair cognition 2) Those who were not consistent in their fasting. Cognition was defined as the mental process of acquisition, storage, processing and retrieval of information. Ramadan fasting was defined as voluntary abstinence from eating and drinking as a religious act during the month of Ramadan from dawn to dusk. A structured questionnaire was designed for this study containing some background information of the participants, physical parameters like blood pressure and blood sugar at the time of data collection. To assess different aspects of cognitive process, trail making test (TMT) part A and B, simple reaction time (SRT) and Stroop test were used. The participants were given clear instruction about the tests. The time taken for trail making in part A which consist only of numbers and part B which consist of both number and letter was recorded in seconds. Three attempts of simple reaction time were recorded in milliseconds and the average number was finally taken. Every participant was given a single chance to take a Stroop test. They had to choose the right color written in an incongruent ink making it a challenge. Choosing a wrong color signaled the termination of the test and the number of successful choices taken by participants was counted. Every data of study subjects was recorded 1 week before Ramadan (BR) and between week 3 and 4 during Ramadan (DR). Data was analyzed using Statistical Package for Social Science (SPSS) version 30. Results were expressed as mean \pm SD. Independent and paired t-test, multiple regression analysis and Pearson's correlation were used as statistical tool. Significance level was set at 0.05 or lower.

Result:

Our study participants (N=53) were overwhelmingly female (67.9%) and most were graduate physician (73.2%). Specialist doctors (n=15) were mostly male (66.6%). Age range of the study population spanned from 24 years to 69 years (32.82 \pm 11.32).

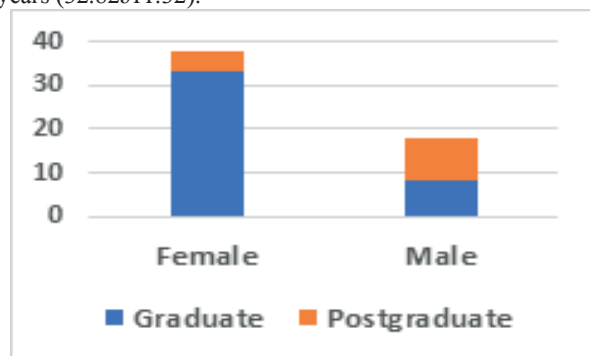


Figure 1: Gender and education level of participants

Regression analysis was performed to evaluate the confounding effect of parameters like age, duration of last meal taken, random blood sugar immediately before the test, duration of sleep of the preceding night, systolic blood pressure and diastolic blood pressure on the outcome variables (SRT, ST, TMT A and TMT B). Age was found to be significantly prolonging the SRT ($P<0.001$), TMT A ($P=0.001$) and TMT B ($P=0.006$). Increment of diastolic blood pressure was associated with poorer TMT B score ($P=0.045$) but the reverse was the case with systolic blood pressure ($P=0.041$). Independent sample t-test had shown no significant differences in cognitive tests among graduate versus postgraduate doctors but female participants were significantly faster in TMT A ($P=0.022$) and TMT B ($P=0.038$) compared to the male. Paired t test of the SRT, ST, TMT A and B has shown that, with the exception of ST, all other test time in fact decreased during Ramadan. However, neither the improvements in SRT, TMT-A, TMT-B nor the decline in ST were found to be statistically significant.

Table I: Observed value of study parameters before and during Ramadan

Parameters	Before Ramadan (Mean \pm SD)	During Ramadan (Mean \pm SD)	P value
SRT	473.11 \pm 128.95	447 \pm 122.7	0.082
ST	14.89 \pm 9.74	16.53 \pm 10.96	0.354
TMT-A	32.89 \pm 15.07	31.3 \pm 14.8	0.420
TMT-B	59.74 \pm 21.14	57.45 \pm 20.51	0.358
RBS	5.19 \pm 2.17	4.98 \pm 0.68	0.466
SBP	110.94 \pm 12.13	106.79 \pm 11.39	<0.001
DBP	75.38 \pm 8.48	74.81 \pm 7.59	0.655

On the other hand, random blood sugar and diastolic blood pressure both decreased to some extent during Ramadan but the change was insignificant. Systolic blood pressure had dropped significantly during Ramadan ($P<0.001$).

Discussion:

Our study aimed to explore the effect of Ramadan fasting on the cognitive functions of physicians actively involved in patient care. The study is novel in a sense that, no article on such matter had published in Bangladesh until the writing of this manuscript. The results indicates that, the null hypothesis of no effect prevails. Our baseline premise was: cognition is likely to be affected if there is lack of hydration, nutrition and sleep. We were particularly keen to see the effect of blood glucose and the cognitive performance. Blood glucose had not changed significantly from the baseline pre-Ramadan reading among the participants and it had no negative impact on the physician's cognition. This finding is in alignment of the previous studies that also had revealed steady cognitive capability despite intermittent calorie restriction^{9,10,11}. The seemingly counterintuitive phenomena can be explained by glucose load prior the day

long fasting in the form of Sahur meal, compensatory gluconeogenesis and increased alertness of the fasting individual to counteract the “perceived” lack of brain fuel^{5,12}. Some notable research on the same issue had also noted that, the circadian variance of blood glucose that leans towards upper limit of normalcy can in fact cause a slower cognition¹³. They argued that, the prescribed hours of fasting during Ramadan effectively prevents these troughs and valley and maintains a somewhat stable blood glucose that can boost cognitive functions. From physiological stand point, it was noted that unless the blood glucose drops down to below 3.6 mmol/l, it is unlikely to suffer from brain fog¹⁴. Under normal circumstances, the blood glucose is unlikely to fall down below this mark for the reasons explained before. Moreover, it must be remembered that, all of our participants were otherwise healthy. So, the effect of blood glucose on cognition in cases where wide fluctuation is a possibility remains uncertain. Another point to be noted is the timing of the data collection. We had deliberately chosen week two and three for our “during Ramadan” data gathering as some earlier studies have shown that, cognitive performance may remain unstable in the earlier days of Ramadan but becomes stable as the days progresses¹⁵. Our finding contradicts to those researchers who had findings suggestive of cognitive slowness in response to “fasting”, many of which was defined outside the scope of Ramadan and was not done on physicians^{16,17}. So, we think, the seemingly incongruent results can be secondary to the vastly different study population and fasting method. As for the hydration, the current study had not investigated the objective evidences of dehydration and its association of cognition but earlier works indicates that, human brain adopts pretty well to slowly developed water deprivation¹⁸. This anecdotal inference was also indirectly reflected in our study as cognition was not seen to suffer even after long hours of no drinking for prolonged periods. Sleep duration of each participant was calculated and tested as a possible confounder to influence the outcome variables. The duration of sleep and its quality and continuity inevitably changes during the holy month of Ramadan for several factors like night prayers, pre-dawn meal and late bed time to compensate for morning tasks. Although it may sound obvious that this sleep deprivation should have a negative impact on the cognitive skills of our brain but our data shows no significant differences compared to pre-Ramadan days. We acknowledge the fact that, some earlier studies had shown meaningful negative influence of sleep deduction on cognitive processes¹⁹. Once again, the definite study population of fasting adults who fast for an entire month with the religious mindset need to be considered to put things in perspective. The study was weakened by the non-random sampling method and lack of a control group. Although our intention was to collect during Ramadan data towards the end of the day and closer to breaking of

fast to maximize the abstinent hours, it was not possible for all cases. Moreover, the battery of tests that were used to estimate the cognitive function were not comprehensive. We hope that a multicentric study with a more diverse sample will shed more light on this emerging issue in near future.

Conclusion:

It can be inferred from our study that, Ramadan fasting does not negatively impact the cognitive functions of treating physicians.

Conflict of Interest: None.

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