International Journal of Pharmaceutical Archive-4(1), 2015, 6-8
Available online through www.ijpaonline.info ISSN 2319-7226

RESEARCH ARTICLE

DOES RAMADAN FASTING AFFECT PROCESSING SPEED AND ATTENTION IN TEENAGE GIRLS?

K Amrutha Kumari[1], T Rama Kranthi[2], Bhupathi Syamala[2] and Simmi Soni[3]*

[1]Professor and Head, Department of Physiology,
Dr. V.R.K. Women's Medical College Teaching Hospital & Research Centre,
Aziznagar, R. R. District-500075, Telangana, India.

[2]Assitant Professor, Department of Physiology,
Dr. V.R.K. Women's Medical College Teaching Hospital & Research Centre,
Aziznagar, R. R. District-500075, Telangana, India.

[3]Associate Professor, Department of Anatomy,
Dr. V.R.K. Women's Medical College Teaching Hospital & Research Centre,
Aziznagar, R. R. District-500075, Telangana, India.

(Received on: 19-01-15; Revised & Accepted on: 29-01-15)

ABSTRACT

Purpose: *The aim of our study was to analyze the effect of Ramadan fasting on processing speed and sustained attention in teenage girls.*

Methodology: *Processing speed and sustained attention of 146 female medical students were examined by Digit symbol substitution test and Digit Vigilance test during and after Ramadan.*

Results: *Sustained attention decreased significantly (p value – 0.001) during Ramadan and number of errors also increased during Ramadan (p value – 0.001). However, the processing speed did not vary significantly (p value – 0.34)*

Conclusion: *Ramadan fasting decreases sustained attention but not processing speed of teenage girls.*

Key Words: *Ramadan, processing speed, sustained attention.*

INTRODUCTION

Ramadan fasting is a religious practice followed by Islamic population usually by healthy adults. Ramadan fasting is different from other cultural and religious fasting as it lasts for about a month. It starts from sunrise and ends at sunset. They take a small meal before sunrise and at the end of the fast they take fruits and meal. During fasting hours they abstain from food and water and spend considerable time for prayer both during day time and night time. There is a controversy regarding the effects of fasting on brain functions. Studies on animals suggest that intermittent fasting (alternate days) improves brain functions.[1] On the other hand, there are reports showing reduced activity, less desire to study and lower ability to concentrate during Ramadan fast, in more than 50 percent of subjects among 265 university students.[2] So the present study was undertaken to find the affects of Ramadan fasting on brain functions like processing speed and sustained attention.

METHODS AND MATERIALS

A total of 146 healthy Muslim female volunteers with a mean age of 18 ± 1 participated in the study. Females with any systemic disease, sleep disorders or eating disorders were excluded from the study. Study was conducted in Department of Physiology, Dr V R K women's medical college, Telangana, India. Data was collected 3 days before the end of holy month (during Ramadan) and post Ramadan data was collected 45 days after Ramadan between 10.00 AM to 12.00PM.

Corresponding author: Soni Simmi[3], E-mail: simmisoni9@gmail.com.*

Experimental procedure
The tests were performed according to the instructions provided in the NIMHANS Neuropsychology battery.[3]

Digit symbol substitution test
The Digit Symbol Substitution Test is a test of visuomotor coordination, motor persistence, sustained attention, and response speed.[4] Rapid information processing is required in order to substitute the symbols accurately and quickly. The test consists of a sheet in which numbers 1-9 are randomly arranged in four rows of 25 squares each. The subject substitutes each number with a symbol using a number-symbol key given on top of the page. The first 10 squares are for practice. The time taken to complete the test forms the score.

Digit vigilance test
The Digit Vigilance Test consists of numbers 1-9 randomly ordered and placed in rows on a page.[5] There are 30 digits per row and 50 rows on the sheet. The digits are closely packed on the sheet. The same level of mental effort or attention deployment is required over a period of time. The subject has to focus on the target digits 6 and 9 among other distracter digits and has to cancel the digits as fast as possible without missing the targets or cancelling wrong numbers. Inability to sustain and focus attention levels leads to both increased time to complete the test as well as errors. The time taken to complete the test forms the score.

Statistical Analysis
The data was analyzed by student t-test using MINITAB-4 software.

RESULTS

Significant difference was not seen in processing speed (p value – 0.34) during and after Ramadan but Sustained attention decreased significantly (p value – 0.001) during Ramadan and number of errors were also more during Ramadan (p value – 0.001).

Table-1: Means ± SD of compared parameters during and after Ramadan

Name of the Test	During Ramadan	After Ramadan	p value
Digit Symbol Substitution Test			
i. Time	1.62 ± 0.34	1.57 ± 0.33	0.34
Digit vigilance test			
i. Time	5.52 ± 0.20	4.90 ± 0.15	0.001*
ii. Correct hits	1493.83 ±7.07	1497.04 ± 2.90	0.001*
iii. **Error hits**	6.17 ±7.06	3.04 ± 2.57	0.001*

Student t-test; *Correlation is highly significant at the 0.01 level.

DISCUSSION

Decrease in brain's cognitive ability may be due to prolonged nutrient and water deprivation and altered sleeping pattern and decrease in number of sleeping hours. It was observed that during Ramadan daily energy intakes especially calcium were less than the expenditures both in males and females.[6] The chronobiological studies have shown that Ramadan fasting affects the circadian distribution of body temperature, cortisol, melatonin and glycemia. The amplitude of most of these rhythms decreased and the acrophase shifted. Nocturnal sleep, daytime alertness and psychomotor performance were decreased.[7] In animal model it was proposed that fasting probably blocks the active transport system which removes acid metabolites from the striatum of the brain.[8] Another study documented association between Ramadan diet restrictions and variations of gastric pH, plasma gastrin, insulin, glucose, and calcium on a circadian basis.[9] Some studies have shown that psychomotor performance, such as memory, is impaired by Ramadan fasting[10] and increase in irritability during Ramadan.[11] Ho-Heng Tian *et al*, showed that during Ramadan fasting performance in functions requiring sustained rapid responses was better in the morning, declining in the late afternoon, whereas performance in non-speed dependent accuracy measures was more resilient.[12] The intermittent fasting of Ramadan delays sleep onset, impairs sleep structure, especially REM sleep and the fatigue of sleep deprivation is an important factor likely to compromise performance of speed and accuracy.[13,14] During Ramadan, sleep latency is increased and sleep architecture modified. Sleep period time and total sleep time decreased in Beginning of Ramadan and End of Ramadan. The proportion of non-rapid eye movement (NREM) sleep increased during Ramadan and its structure changed, with an increase in stage 2 proportions and a decrease in slow wave sleep (SWS) duration. Rapid eye movement (REM) sleep duration and proportion decreased during Ramadan.[15] No detrimental effects on health have as yet been directly attributed to intermittent negative water balance at the levels that may be produced during Ramadan.[16]

Ramadan fasting even has a negative impact on educational performance. One additional Ramadan week lowered the final grade of Muslim students by almost ten percent of a standard deviation.[17] To the best of our knowledge, there is hardly any literature analyzing the affects of Ramadan fasting on brain functions in teenage medical girls.

CONCLUSION

The present study revealed significant reverse association between Ramadan fasting and sustained attention among teenage girls. However, further larger studies with more sample size are warranted to authenticate the current findings.

REFERENCES

1. Li L, Wang Z, Zuo Z. Chronic Intermittent Fasting Improves Cognitive Functions and Brain Structures in Mice. PLoS ONE. 2013; 8(6):e66069. doi:10.1371/journal.pone.0066069.
2. Afifi Z. Daily practices, study performance and health during the Ramadan fast. The Journal of the Royal Society for the Promotion of Health. 1997; 117:231–235.
3. Rao SL, Subbakrishna DK, Gopukumar K. NIMHANS neuropsychology Battery; 2004.
4. Wechsler D. Manual for the Wechsler adult intelligence scale-revised. New York: Psychological Corporation; 1981.
5. Lezak MD. Neuropsychological Assessment. 3 rd ed. New York: Oxford University Press; 1995.
6. Karaaðaoðlu N, Yücecan S. Some behavioural Changes observed among fasting subjects, their nutritional habits and energy expenditure in Ramadan. International Journal of Food Science and Nutrition. 2000; 51: 125-34
7. Roky R, Houti I, Moussamih S, Qotbi S, Aadil N. Physiological and chronobiological changes during Ramadan intermittent fasting. Ann Nutr Metab. 2004; 48(4):296-303.
8. Fuenmayor LD and García S. The effect of fasting on 5-hydroxytryptamine metabolism in brain regions of the albino rat. Br J Pharmacol. 1984; 83(2): 357–362.
9. Iraki L, Bogdan A, Hakkou F, Amrani N, Abkari A, Touitou Y. Ramadan diet restrictions modify the circadian time structure in humans. A study on plasma gastrin, insulin, glucose, and calcium and on gastric pH. J Clin Endocrinol Metab. 1997;82(4):1261-73.
10. Hakkou, F, Wast D, Jaouen C. Does Ramadan impair vigilance and memory? Psychopharmacol. 1988; 96: 213.
11. Kadri N, Tilane A, El Batal M, Taltit Y, Tahiri SM, Moussaoui D. Irritability During the Month of Ramadan. Psychosomatic Medicine. 2000; 62:2280-5.
12. Tian HH, Aziz AR, BPE; Png W, Yeo D. Effects of Fasting During Ramadan Month on Cognitive Function in Muslim Athletes. Asian Journal of Sports Medicine. 2011; 2(3):145-53.
13. Roky R, Iraki L, HajKhlifa R, Lakhdar Ghazal N, Hakkou F. Daytime alertness, mood, psychomotor performances, and oral temperature during Ramadan intermittent fasting. Ann Nutr Metab. 2000; 44(3): 101-107.
14. Williamson A M, Feyer AM. Moderate sleep deprivation produces impairments in cognitive and motor performance equivalent to legally prescribed levels of alcohol intoxication. Occup Environ Med. 2000; 57: 649-655.
15. Roky R, Chapotot F, Hakkou F, Benchekroun MT, Buguet A. Sleep during Ramadan intermittent fasting. J Sleep Res. 2001; 10(4):319-27.
16. Leiper JB, Molla AM, Molla AM. Effects on health of fluid restriction during fasting in Ramadan. Eur J Clin Nutr. 2003; 57(2):S30-8.
17. Oosterbeek H, Klaauw BVD. Ramadan, fasting and educational outcomes; Economics of Education Review. 2013; 34: 219-226.

Source of support: Nil, Conflict of interest: None Declared