RESEARCH ARTICLE

Changes in caloric consumption, physical activity, body mass index and sleeping pattern during holy month of Ramadan among doctors of a public sector University

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Abstract

Objective: To determine the change in caloric intake, physical activity, body mass index and sleeping pattern during Ramadan among doctors.

Method: The longitudinal study was conducted at a public-sector medical university in Karachi from April to May 2020, and comprised healthy doctors of either gender who planned to fast during Ramadan. Data was collected using a multitude of validated structured tools by trained data collectors. Data was analysed using SPSS 20.

Results: Of the 193 subjects, 103(53.4%) were females and 90(46.6%) were males. The overall mean age was 30.05±9.4 years. Caloric intake in the month before Ramadan was significantly higher 2288±495kcal/day than during Ramadan 2089±491kcal/day (p<0.001). Calories from proteins decreased and those from fats increased (p<0.001). Metabolic equivalent of task per minute per week increased significantly during Ramadan (p<0.001). Overall sleep per day decreased significantly, and there was an increase in daytime sleep and a decrease in night-time sleep (p<0.05). Body mass index also dropped significantly (p=0.005).

Conclusion: Fasting during Ramadan had a positive effect on body mass index and physical activity levels of doctors, while the quality of diet and sleep was affected negatively.

Keywords: Caloric consumption, Physical activity, Body mass index, Sleeping pattern, Ramadan. (JPMA 73: 1987; 2023)

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Introduction

Fasting is a key religious practice in Islam in which adult Muslims abstain from eating and drinking for 11-16 hours depending on duration of the day for one month.[1] Fasting brings in significant change in lifestyle as only two main meals are taken at dawn (Sahoor) and at sunset (Iftar).[2] Meals taken during sunset are generally calorie-rich with high fat and carbohydrate (CHO) content.[3-5] Some studies have reported increased caloric intake and increased body mass index (BMI) during Ramadan.[6-8] Findings on the effect of fasting on weight are variable as some studies show weight-loss, some show no change in weight, while others show weight-gain.[9-11] A recent prospective study from Pakistan found reduction in BMI during Ramadan.[12] Sleep habits are also found to be altered during Ramadan among those who fast. Previous studies reported that there was decreased sleep time by 1 hour to 1.8 hours, and there was increased daytime sleeping.[4,13] In addition to caloric intake and sleep pattern, physical activity is a very important factor. Studies have reported decreased physical activity during Ramadan.[14,15] A meta-analysis concluded that overall there was no influence on physical activity during Ramadan either in daytime during fast or during night-time.[16]

There is dearth of data regarding how fasting influences the lifestyles of different populations. Studies done in Pakistan have not studied how the caloric intake, physical activity and BMI vary in the general population during fasting. The current study was planned to fill the gap in literature by exploring the changes with respect to caloric intake, physical activity, sleep pattern and BMI during Ramadan among doctors who are supposed to be more knowledgeable about healthy lifestyle and know the importance of balanced diet, physical activity and sleep discipline.

Subjects and Methods

The longitudinal study was conducted at the public-sector Jinnah Sindh Medical University (JSMU), Karachi, from April to May 2020. After approval from the institutional ethics review board, the sample size was calculated using online Statulator 2014 calculator with expected effect size of 20%[7] at 95% confidence level and 80% power.[17] The sample was raised using non-probability convenience sampling technique, distributing the sample according to clinical and non-clinical nature of job and gender. Those included were doctors of either gender working at JSMU and its affiliated hospitals who planned to fast during Ramadan. Those who

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suffered from chronic diseases, like hypertension, diabetes, chronic kidney disease and chronic liver diseases, and those were pregnant were excluded.

Data was collected after taking written informed consent from the subjects. The data collection process was supervised by the principal investigator who trained and monitored 05 data collectors who were hospital interns. Every day, the forms were checked for completeness and accuracy. A total of 20 forms were filled out daily i.e. 4 forms by each medical intern. Forms that were found appropriately filled were also discussed with nutritionists for authenticity and reliability.

Keeping in view the day-to-day variability in dietary patterns, sleep patterns and in physical activity, data was collected on 4 different days (2 weekdays and 2 weekend days) before Ramadan and on 4 different days (2 week days and 2 weekend days) during Ramadan. On each visit, 24-hour recall was noted for food frequency, sleep pattern in the preceding 24 hours and physical activity of the preceding week. BMI was recorded before Ramadan and in the last week of Ramadan.

The study questionnaire, which was first piloted, had 4 sections. The first section recorded demographic data, like age, gender, qualification, designation and place of work, as well as anthropometric measurements; height in cm and weight in kg. The second section recorded information on dietary intake based on 24-hour food recall structured questionnaire, which was modified to suit foods of local availability.[18] It gained details about types of foods eaten, average size or amount (small, medium or large plate, bowl or glass) taken and how the food was cooked (raw, superficial oil-fried, deep oil-fried, boiled, baked or air-fried). CHO, fat and protein exchanges were calculated to have the consumed calories per day assessment. One CHO exchange was considered equal to 15 gm and each gram gave 4 calories. One fat exchange was regarded equal to 5gm and each gram gave 9 calories. One protein exchange was considered equal to 7gm and each gram gave 4 calories.[3,11] After calculating the calories for each day, average overall calories, average CHO calories, average fat calories and average protein calories from 4 days before and during Ramadan were calculated. According to the Pakistan dietary guidelines for better nutrition[17] daily caloric requirements for male aged 18-59 years is 3091 calories, and for females aged 18-59 years it is 2408 calories. Intake above these values was considered high.

The third section recorded information on physical activity as per the World Health Organisation (WHO) validated proforma which was piloted to assess suitability.[19] It gathered information on 4 dimensions of physical activity which included type of activity (modified according to profession as 'doctors'), its frequency (days/week), duration (minutes/day) and intensity. Moderate-intensity activities included brisk walking, cycling, gardening, offering Muslim prayers five times a day, or washing. Vigorous-intensity activities included weightlifting, running or playing games or jumping ropes. After noting the minutes per week of vigorous, moderate and mild activity, metabolic equivalent of task (MET) per minute values were calculated. Vigorous-activity minutes per week were multiplied with factor 7, moderate-activity minutes per week were multiplied with factor 6 and mild-activity minutes per week were multiplied with factor 2.5. If average MET-minute from vigorous and/or moderate activity were >600MET-minutes per week, the participants were considered physically active.[22-22]

The last section of the questionnaire obtained information on sleeping pattern which included overall hours of sleeping per day and their break up of daytime and night-time sleeping.

Data was analysed using SPSS 20. Qualitative variables were presented as frequencies and percentages, while means with standard deviation (SD) were calculated for quantitative variables.

Average caloric intake per day, sleeping time in hours, MET-minutes for physical activity and BMI before Ramadan and during Ramadan were compared using paired t test. Non-parametric Wilcoxon sign rank test was used if the variables did not meet the assumption of normality determined by Kolmogorov-Smirnov test or Shapiro-Wilk test. Mcnemar Test was applied for comparison of percentage of calories obtained from CHO, proteins and fats and status of being physically active before Ramadan and during Ramadan. $P<0.05$ was considered significant.

Results

Of the 200 subjects enrolled, 193 (96.5%) finished the study; 103(53.4%) females and 90(46.6%) males. The overall mean age was 30.05±9.4 years. There were 44(22.8%) non-clinical doctors from the department of public health, 36(18.6%) non-clinical doctors from the department of basic sciences 36(18.6%) and 113(58.6%) clinical doctors from hospitals. Baseline values were noted for all the subjects (Table 1).

Overall caloric intake before Ramadan was 2288±495 which was significantly ($p<0.001$) higher than during Ramadan 2089±491. Average weekend day calorie intake was higher than on weekdays (Table 2). The percentage of calories obtained from CHO did not change significantly ($p=0.09$), while the percentage of protein calories

significantly decreased (p<0.001) and the percentage of fat calories significantly increased (p<0.001).

The decrease in caloric intake was found regardless of age and gender, while non-clinical doctors did not show any significant change (Table 3).

Overall MET-minutes per week increased significantly during Ramadan (p<0.001). Average mild and rigorous activity minutes per week decreased significantly (p<0.001), whereas average moderate activity minutes per week increased significantly (p<0.001). The increase in MET minutes was consistent in age groups, genders and clinical doctors (p<0.05), while non-clinical doctors did not show any significant increase (p>0.05). Overall sleep per day significantly decreased during Ramadan (p<0.05). Daytime sleeping increased and night-time sleeping decreased, and the pattern was consistent in age groups and professional disciplines, while males did not show any significant reduction in sleep (Table 4).

Overall reduction in BMI was significant (p=0.005). BMI did not change significantly in those aged >40 years, males and non-clinical doctors from public health (Table 5).

Table-1: Socio-demographic and anthropometric profile of the participants (193).

Variables	n (%)
Mean Age (years)	30.05±9.40
Male	90(46.6)
Female	103(53.4)
Designation	
Seniors Faculty:	95 (49.2)
Professors	6 (3.1)
Associate Professor	9 (4.7)
Assistant Professor	30(15.5)
Deputy Director	5 (2.6)
Senior Registrar	28(14.5)
Lecturer	17(8.8)
Trainees:	59 (30.5)
Post FCPS Fellow	6 (3.1)
Postgraduates FCPS	40(20.7)
House Officers	13(6.7)
Students:	39(20.2)
MSPH Students	24(12.4)
Other Students	15(7.8)
Weight Baseline: Mean±SD	68.06±15.21
Height Baseline: Mean±SD	165.44±8.76
BMI Baseline: Mean±SD	24.84±4.97

SD: Standard deviation, FCPS: Fellow of College of Physicians and Surgeons, MSPH: Master of Science in Public Health, BMI: Body mass index.

Table-2: Mean caloric intake a month before and during Ramadan.

Variable	Pre-Ramadan Mean±SD	Ramadan Mean±SD	*p*-value
All Participants			
Caloric intake)	2288±495	2089±491	<0.001
CHO calories Percentage	54.47±5.61	53.69±6.54	0.09
Fat calories Percentage	28.65±3.97	32.27 ±5.86	<0.001
Protein calories Percentage	16.91±4.03	14.47±4.01	<0.001
Caloric intake on weekends	2491±781	2185±530	<0.001
Caloric intake on weekdays	2124±482	2003±503	<0.001
Comparison of Overall Calories			
Mean Age(years)			
<40	2287±508	2075±464	<0.001
≥40	2287±464	2123±554	0.022
Gender			
Male	2520±468	2338±492	<0.001
Female	2085±424	1871±374	<0.001
Discipline			
Non-Clinical from Public Health	2249±532	2152±515	0.240
Non-Clinical from Basic Sciences	2049±432	1907±383	0.067
Clinical from Hospitals	2378±474	2122±502	<0.001

SD: Standard deviation, CHO: Carbohydrate.

Table-3: Comparison of physical activity patterns a month before and during Ramadan.

Variable	Pre-Ramadan Mean±SD	Ramadan Mean±SD	*p*-value
Rigorous activity minutes per week	19.68±55.52	4.39±24.45	<0.001
Moderate activity (minutes per week)	38.65±81.65	175.26±189	<0.001
Mild activity (minutes per week)	239.83±179	182±191	<0.001
±1157	±1157	±1157	±1157
Physically Active (%)	57(29.5%)	114(59%)	<0.001
Comparison of Overall MET minutes			
Mean Age (years)			
<40	934±765	1449±1069	<0.001
≥40	1049±868	1690±1486	0.036
Gender			
Male	856±666	1522±1247	<0.001
Female	1063±885	1581±1167	<0.001
Discipline			
Non-Clinical from Public Health	970±838	1330±1294	0.326
Non-Clinical from Basic Sciences	1060±1157	1281±1107	0.299
Clinical from Hospital	933±626	1728±1174	<0.001

SD: Standard deviation, MET: Metabolic equivalent of task.

Table-4: Comparison of sleep patterns a month before and during Ramadan.

Variable	Pre-Ramadan Mean±SD	Ramadan Mean±SD	*p*-value
Average Day time sleeping hours	0.74±0.83	2.90±1.96	<0.001
Average Night time sleeping hours	6.81±1.27	4.31±1.83	<0.001
Comparison of Overall Sleeping hours			
Mean Age (years)			
<40	7.70±1.13	7.45±1.20	0.006
≥40	7.14±1.10	7.68±1.10	0.004
Gender			
Male	7.43±1.13	7.21±1.19	0.54
Female	7.64±1.16	7.25±1.25	<0.001
Discipline			
Non-Clinical from Public Health	7.44±1.10	6.95±1.14	0.08
Non-Clinical from Basic Sciences	7.45±1.05	7.04±1.38	0.013
Clinical from Hospital	7.61±1.20	7.4±1.18	0.040

SD: Standard deviation

Table-5: Comparison of body mass index (BMI) a month before and during Ramadan.

Variable	Pre-Ramadan Mean±SD	Ramadan Mean±SD	*p*-value
Mean BMI	24.84±4.97	24.7 ± 4.95	0.005
BMI Categories (%)			
Normal(<23)	72(37%)	76(39%)	<0.001
Overweight(>23-27.5)	66(34%)	61(32%)	
Obese (>27.5) (n=55)	55(29%)	56(29%)	
Comparison of BMI (kg/m^2)			
Mean Age(years)			
±1.13	±1.13	±1.13	±1.13
<40	23.82±4.69	23.60±4.67	0.005
≥40	27.40±4.75	27.47±4.59	0.470
Gender			
Male	26.09±4.96	26.05±4.73	0.837
Female	23.74±4.73	23.52±4.79	0.05
Discipline			
Non-Clinical from Public Health	26.05±4.50	26.10±4.35	0.897
Non-Clinical from Basic Sciences	23.07±5.12	22.66±5.06	0.05
Clinical from Hospital	24.93±4.96	24.81±4.96	0.05

SD: Standard deviation

Discussion

Only around one-third of the doctors in the current study had their BMI in the normal range in both pre-Ramadan and Ramadan phases. The findings suggest that the diet and lifestyle that doctors tend to adopt during Ramadan lead to a significant decrease in BMI which is a positive finding, considering that almost two-thirds of the doctors were either overweight or obese. A systematic review reported that fasting time (min/day) is a significant moderator for weight change at the end of Ramadan.[23] Similar findings on reduction in BMI have also been reported in other studies.[12,24] One reason for reduction in BMI may be the fact that the overall caloric intake before Ramadan was higher than during Ramadan.

On the contrary, a few studies have reported higher intake of overall calories during Ramadan.[6,7] This difference may be due to the fact that study populations were different in these studies. While the overall caloric intake decreased, proportion of fats in the diet increased significantly and protein intake decreased. A study earlier reported a decrease in protein intake during Ramadan.[25] This means that decrease in calories contributed partially to weight-loss, but the quality of diet was compromised which may affect the body negatively because proteins are the main structural elements of human body. Reduction in BMI can also be attributed to improvement in physical activities during Ramadan. This finding is contrary to other studies which reported decline in physical activity during Ramadan.[14,15] It is possible that the previous studies did not account for night-time Taraweeh prayers. Moreover, since the study was done during the onset of coronavirus disease-2019 (COVID-19) outbreak, many doctors reported doing the household chores themselves during the study period.

The activity levels improved, and the doctors struggled to keep their sleeping patterns consistent during Ramadan, and their resting time decreased significantly. In particular, night-time sleeping hours significantly decreased. This may be either due to night-time prayers, awakening for Sahoor for keeping fast or other activities, but, regardless of the reason, it must be kept in mind that 8 hours of sleep is essential for healthy functioning of the body, and compromising on sleep for long periods of time may start manifesting negative signs and symptoms for the physical and mental health of the individual. These findings are consistent with previous literature.[4,13]

Stratification of the current results revealed interesting findings. While the caloric intake was significantly reduced across age and gender groups, non-clinical doctors did not show any significant change in the amount of calories consumed. This may be due to the fact that working requirements for clinicians are more demanding than non-clinicians during Ramadan. Similarly, no significant change in physical activity and sleeping pattern was observed for non-clinicians, which further proved that it was easier for them to maintain their pre-Ramadan lifestyle. As a result, the average BMI of non-clinicians also did not vary significantly before and at the end of Ramadan.

The strength of the current study is that it used standard extensive methods of caloric and physical activity estimates. Besides, data was collected on 4 different days to account for the day-to-day variability in outcomes.

The current study has its limitations as well. Firstly, it did not stratify against different specialties of the clinical doctors because of its low sample size. Secondly, biological markers and innovative technologies were not used due to financial constraints. Electronic devices for more accurate caloric counting, measuring sleeping time and physical activity could have been used to get more accurate results. Thirdly, response bias for 24-hour recall proforma for diet and 7-day physical activity could not be ruled out. Finally, exchanges for CHO, protein and fat were calculated for caloric calculation that may have underestimated the total caloric intake.

Future research should be carried out on a larger sample covering broader demographical characteristics and taking more study settings to gather more diverse and generalisable data. Besides, interventional studies with controls can be carried out to improve lifestyle patterns before and during Ramadan.

Conclusion

The fasting month of Ramadan had a significant impact on caloric intake, sleeping time and pattern, physical activity and BMI, indicating a positive effect in terms of BMI and physical activity levels of the doctors, while quality of diet and sleep were affected negatively.

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