

## SLEEP AND WAKEFULNESS DURING HOLY MONTH OF RAMADAN

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**Background:** The aim of this study was to explore sleep changes during the month of Ramadan and to compare the sleep pattern during the fasting and non fasting period in normal healthy individuals. **Method:** This study was carried out at the department of Physiology FUMC Rawalpindi, Pakistan from 1<sup>st</sup> September 2006 to 31<sup>st</sup> October 2006 during which occurred the holy month of Ramadan from 25<sup>th</sup> September 2006 to 24<sup>th</sup> October 2006. A total of 435 subjects (172 women and 263 men) were provided the sleep cards to record their sleep hours. **Results:** During Ramadan the total sleep time (TST) for the same individuals showed a significant difference ( $P < 0.05$ ) i.e. during fasting period as compared to non fasting period. During fasting period individuals slept 46minutes per day more than during none fasting period. **Conclusion:** Sleep behavior changes during Ramadan in fasting individuals indicate that the life style changes during Ramadan having a significant effect on sleep behavior. Factors other than fasting may play an important role in modifying an individual's behavior during Ramadan. Further studies are needed to confirm these factors and sleep pattern during month of Ramadan.

**Key Words:** Sleep pattern, Wakefulness, Fasting and Ramadan.

### INTRODUCTION

Fasting during Ramadan is a religious duty for all healthy adult Muslims. Ramadan is the ninth month of the Islamic lunar calendar. Many of the world's great religions recommend a period of fasting or abstinence. The Islamic fast during the month of Ramadan during which a whole month is dedicated to fasting is particular to Islam. It is strictly observed by millions of Muslims worldwide. Since more than a billion people worldwide follow Islam. It is assumed that hundreds of millions of people observe the Ramadan fasting each year. The experience of fasting teaches Muslims self-discipline and self-restraint, and reminds them of the feelings of the impoverished<sup>1</sup>. Fasting is not obligatory for children. Menstruating women as well as sick and traveling people are excused and pregnant and lactating women are permitted to postpone the fasting during Ramadan, however, they should fast during another month of the year, when they have no reason for exemption.

Ramadan is the month during which Muslims must refrain from eating and drinking from dawn to sunset. Fasting during Ramadan is one of the 5 major rules of Islam. Adults who are ill or traveling and women who are breast-feeding or menstruating are temporarily exempted from complying with these regulations. Ramadan occurs in the ninth month of lunar (Hijra) calendar, and lasts between 29 and 30 days. The lunar calendar does not correspond to the Gregorian calendar, as the lunar (Hijra) year contains 354 days, such as the lunar year is 11days shorter than the year using Gregorian months, and hence Ramadan occurs in different seasons. This result in variations in the duration of the daily fasting time, being longer in summer than in winter, which

necessitates the need for documenting the time of dawn and sunset in research related to Ramadan. Ramadan fasting is distinct from regular voluntary or experimental fasting by limiting the period of fasting to daylight (dawn to sunset), the month of the practice, the fact that the fasting individual is not allowed to drink or smoke during daylight<sup>2</sup>, and change in the usual circadian pattern of eating, whereby caloric intake increase at night.

Roky et al<sup>3</sup> demonstrated a reduction in subjective alertness during fasting at 0900 hours and an increase at 2300 hours in fasting individuals in Morocco. They also reported an increase in the evening types and a decrease in the morning types of fasting individuals during Ramadan. However, these changes cannot be generalized to all societies and may not be applicable to the population in Muslim Countries only since sleep habits during Ramadan may vary with the climate situation, cultural backgrounds, and particular customs of each country. Studies in Morocco<sup>4,5</sup> demonstrated a reduction in TST during Ramadan. Therefore, the attendant cultural and lifestyle changes during Ramadan could be considered as a potential model affecting sleep patterns in individuals regardless of fasting.

The present study was undertaken in an attempt to use a larger and more homogeneous group of motivated Muslims performing their religious duty of fasting during Ramadan in the hope of throwing more light on their sleep and wakefulness pattern during these special sacred days. In the holy month of Ramadan all Muslims offer special long prayers "TARAWEEH" till late night which demands great tolerance and stamina more challenging and arduous task is to get up before dawn for a special meal i.e. "SAHRIE" and then to follow all five times regular

prayers throughout day and night, no eating and drinking upto sunset i.e. "IFTAR" time. The most noteworthy aspect is keeping busy in their routine professional duties without any decline in their performances<sup>6</sup>. According to some mis-beliefs it is wrongly interpreted that during the month of Ramadan, those who fast regularly undergo disturbance of sleep which affect negatively on their performance and mood. Without going much in detail to register the altered symptom, we have just tried to register only duration of sleep (TST) and wakefulness, naps and their individual duration and eventually to register "sleep dept" if it is compensated in these fasting individuals during the post Ramadan days.

This study was carried out to assess the effect of Ramadan and its attendant life style changes (TST), sleep habits, daytime sleepiness (naps), major disturbances of sleep and sleep debt in the individuals who followed "ETEKAF". We hypothesized that the attendant cultural and religious changes specially fasting during Ramadan will affect sleep patterns of fasting individuals to variable degrees.

## **SUBJECTS AND METHODS**

This study was carried out at Foundation University Medical College Rawalpindi. A total of 435 healthy subjects (172 women and 263 men) were selected to participate in this study. All the subjects belonged to different socio-economic groups (Table - I).

Participants in small groups were explained the aim and objectives of the study. A Proforma (Figure-1) for general parameters of health was filled by the subjects and written consent to participate in the study was obtained. Each participant was given a sleep chart (Figure-I) to mark sleep hours for one month. The instructions asked for honesty and accuracy (since no external check could be made) to the nearest 30 minutes. A complete specimen chart for the record of one month sleep was shown to all participants during instructions session. It was emphasized that only day by day record of a person hours of sleep has to be marked on charts and only the time actually spent sleeping (whether in bed or elsewhere) was to be recorded and not the time one spent awake in bed. It was also explained that if any difficulty was experienced in recalling times, then the day in question was to be left blank.

The sleep charts (Figure-1) were of a type previously used and described fully Masterton<sup>7</sup> in 1965. Each chart lasts for one month (31 days). Two charts were given to each participant at monthly intervals in an attempt to get one month sample of sleep record, respectively for the months of September 2006 and October 2006. Coincidentally the Holy month of Ramadan of the Islamic calendar fell

from 25<sup>th</sup> September 2006 to 24<sup>th</sup> October 2006 during these two months.

The subjects were residents of Rawalpindi and Islamabad were drawn from all levels of society. In general the subjects belonged to average socioeconomic group but slightly more intelligent. All subjects were asked to declare any illness, medication or unusual occurrence which might upset their daily routine.

## **RESULTS**

435 healthy subjects (132 female and 263 male) were selected who finally returned a set of two months sleep cards complete and suitable for analysis. **Table-1** shows age wise distribution of all the subjects selected for the study including their professional status. **Table-2** shows the distribution of male and female volunteers to match their age and Body Mass Index (BMI). Thus a 59 days sample of data (30 days fasting and 29 days non-fasting) was available from the from all the volunteers.

The following dependent measures were extracted from the sleep cards:-

1. The mean duration of sleep per 24 hours.
2. The number of disturbance of major sleep period per 24 hours.
3. The mean duration of these disturbances per 24 hours.
4. The number of naps, taken outside the major sleep period.
5. The mean duration of these naps.

It should be noted that the disturbances of major sleep periods and the naps were only those lasting for greater than 30 minutes, any such happening of a brief duration of less than 30 minutes would not have been recorded.

The data was analysed for comparison of sleep patterns during fasting periods and non-fasting period by means of Mann-Whitney U Test (Seigel<sup>8</sup>). **Table-3** shows that there were significant differences in the two groups in term of dependent sleep measures. The fasting period sleep duration was significantly more by (about 48 minutes), as compared to the non-fasting days and fasting subjects took significantly longer naps than on the days when they were not fasting. However, in post-Ramadan days increased duration of sleep hours and increased number of naps occurred so that sleep dept was paid by all those subjects, whose sleep was incomplete during the month of Ramadan when they were fasting and performing all the related religious duties.

Students 't' test was applied to compare the (TST) of individuals for their fasting period and non-fasting period **Table-4** and this shows that there is significant difference between duration of sleep (TST) of fasting period and non-fasting period in

males however the difference of sleep (TST) time for females showed no significant difference between fasting period and non-fasting period. The same test was used to evaluate the comparison of sleep pattern between male and female subjects for their sleep during fasting period and non fasting period **Table-5.**

This comparison indicates that there is a significant difference between male and female for their sleep (TST) during fasting period as well as during non-fasting period. As a matter of fact females slept more than males per day both during the fasting period as well as during non-fasting period.

**Table-1: Agewise distribution of the subjects of the study**

AGE GROUP	MALE	FEMALE	SOCIAL STATUS & PROFESSION
15-20 YRS	58	25	S,N
21-30 YRS	73	52	T, D, S, N, O.W, M, H.W, L.W,
31-40 YRS	42	58	T, D, S, N, B.D., S.K., H.W., C., O.W., A, L..W.,
41-50 YRS	35	22	T, D, S, O.W., H.W., B.D., A, S.K., C., L.W.
51-60 YRS	43	10	T, D, O.W., H.W., B.D., A., R.O, H.W.,
61-70 YRS	12	5	R.O, H.W., T
<b>TOTAL</b>	<b>263</b>	<b>172</b>	

Teachers =T, Doctors = D, Students = S, Nurses=N, Office Workers=O.W., House wives=H.W. Bus Drivers=B.D, Advocates=A, Shopkeepers=S.K, L, Lab Workers=L.W, Mechanics=M, Chowkidars=C, Retired officers=R.O

**Table-2: Distribution of male and female volunteers to match their age and BMI**

	Males (n=263)	Females (n=172)
Age (Yrs)	34.8±16.4 Range (14.6-69.5)	29.8±20.4 Range (13.2-56.8)
BMI	25.52±0.85	23.68±0.44

**Table-3: Sleep patterns of individuals during fasting period and non-fasting period**

S. No.	Sleep Pattern	Fasting period (30 Days)	Non-Fasting Period (31 Days)	Mann-Whitney U Test (Two Tailed Test)	Results P Value
1.	Mean Duration of Sleep (hr) 24 hrs	7.78	6.82	U < 155	<0.05
2.	Mean no. of disturbances of major sleep period/30 days	6.052	5.046	U < 96	<0.05
3.	Mean duration of disturbances of major sleep period/30 days (hr)	0.740	0.82	U > 142	>0.05 (NS)
4.	Mean no. of naps taken outside major sleep period/30 days.	8.820	5.862	U < 92	<0.05
5.	Mean duration of naps taken outside major sleep period/30 days (hr)	1.342	0.912	U < 82	<0.05

**Table-4: Comparison of sleep (TST) of fasting individuals with their non-fasting period**

	Fasting Period	Non Fasting Period	P value
Male (n=263)	7.76±1.36	6.42±1.12	< 0.5
Female (n=172)	7.82±1.56	7.58±1.38	NS

**Table-5: Comparison of sleep (TST) between males and females for their sleep during fasting period and non fasting period**

	Male (n=263)	Female (n=172)	P Value
Sleep (TST) during fasting period	7.76±1.36	7.82±1.76	<0.05
Sleep (TST) during non-fasting period	6.42±1.12	7.58±1.38	<0.05

## DISCUSSION

Sleep during Ramadan could be explained quite satisfactorily on the basis of behavioural theory proposed by Hobson J.A.<sup>9</sup>. This theory ascribes the purpose of sleep as a mode of behavioural adaptation to the environmental conditions and relative changes in internal environment of the body. Particular ecological niche affecting internal and external cues to release sleep. This release controls and directs the behaviour of organisms to adaptive ends. Motivation strongly influences this whole sequences. If one could consider sleep to be a manifestation of biorhythm system depending on endogenous cues for sleep and waking i.e. time determined state variables (Zeitgebers) which are signals to initiate and sustain the maintenance of complex behavioural sequences associated with the sleep and waking state, then these are unique and uncommon as they appear to be in the month of Ramadan.

Considerable research has been devoted to the early changes in the human sleep/wakefulness pattern from polycyclic regimen present in infancy (Gessel & Amatruda<sup>10</sup>) to the more consolidated pattern usually evident in childhood and adult years (Tune<sup>11</sup>). Changes in the healthy adult sleep pattern have been studied extensively; however, careful observation based on self –kept records have shown that in unusual environments, there are changes in both the duration and distribution of sleep taken. Effect of stay at high altitude (William<sup>12</sup>) and at Arctic (Lewis and Masterton<sup>13</sup>), have described different changes in duration of sleep significantly in some subjects. Similarly, occupational stress may enforce shortened duration of sleep, particularly in hospital medical staff (Mesterton<sup>7</sup>) to such an extent that a “Sleep dept” (Kleitman<sup>14</sup>) was accumulated, which was paid off during holiday periods. A similar “Sleep dept” in the days to follow after Ramadan is expected in the sleep pattern of fasting Muslims, who undergo a special pattern of sleep and wakefulness with squeezed hours of sleep.

During the last four decades, great deal of research has been carried out on the sleep behaviour of people working during irregular hours<sup>15</sup>. Main stress has been laid on studying sleep pattern of industrial shift-workers<sup>13-14</sup> and staff of hospital<sup>7, 16, and 17</sup>. Sleep period of shift workers was less than the usual length per day. However, the medical housemen and nurses (Shah<sup>18</sup>) partly repaid the accumulated sleep deficit during the holiday period while shift workers compensated for the lost sleep by taking lengthy naps during their off daily periods/days. Physiological variations of circadian rhythms in subjects like fasting individuals may or may not be adjusted but it may take from a few days

to a couple of weeks for the rhythm to settle down. As Kleitman<sup>14</sup> indicated that the shift workers get less sleep than non-shift workers, similarly people fasting during Ramadan may get much less sleep as compared to the duration of the sleep in non-fasting days.

The result of this study revealed that the pattern and duration of sleep during the holy month of Ramadan in fasting individuals indicate remarkable changes as compared to sleep and wakefulness in normal healthy adults<sup>19</sup> and shift workers<sup>20</sup>. It is reported that a slightly longer mean duration per day is observed in individuals during the days when they were observing fast than during the non fasting days and this difference is statistically significant ( $P < 0.05$ ).

The alteration in the sleep pattern for the absolute amount of sleep seems to be the major effect of religious performances. Muslims follow strictly some religious duties during the holy month of Ramadan including long prayers at night, “TARAWEEH” and special meal before dawn “SEHRIE” They have to refrain from eating and drinking throughout the day till the sunset when they have a special meal, “IFTAR”. These special patterns in daily routines, certainly affect the normal biological clock and circadian rhythms, which are expected to undergo obvious changes<sup>18</sup> in the chemistry of the body of fasting individual. Much protective behaviour is shown by metabolic pool of the body of fasting individuals even in long interval of fasting<sup>21</sup>.

An average of 35 minutes increase in mean of sleep per day was observed during fasting period mainly due o intrinsic efforts to provide alertness in all the above mentioned religious duties. Certainly this increase in mean of sleep per day is accomplished in the form of naps acquired in various parts of the day rather at nights. Thus the fasting people put major reliance on taking naps in order to achieve a high mean duration of sleep per day and this was a major finding. A few of fasting individuals who showed mean duration of sleep per day less than their counterparts were to pay off their ‘Sleep dept’ in the days to follow the month of Ramadan. It was mainly to their willful efforts to remain awake at night for long prayers ‘NAWAFILS’. It was assumed that the naps taken outside the major sleep period and of longer duration are an adequate compensation for distribution and shortened sleep refrains in the dark hours of sleep.

Sleep may occur at virtually any time provided that environmental conditions are propitious. In humans, the capacity to fall asleep during habitual waking hours is made use of in the multiple sleep latency test (MSLT) for the assessment

of day time sleep propensity (Karsakadom<sup>22</sup>). Sleep is definitely favoured when environmental conditions (Campbell<sup>23</sup>) are not activating. Also availability of food after a period of food deprivation increases sleep. Food deprivation for fasting Muslims, when they omit their regular lunch/daytime meals, may variable affect different individuals. Naps during the afternoon in fasting Muslims are very wrongly interpreted as that, during the month of Ramadan, those who fast regularly, undergo disturbance of sleep, which affect negatively their performance and mood. During this study no such complains were observed.

Sleep pattern during the month of Ramadan in the fasting individual as compared to rotational workers (Wyatt<sup>20</sup>) showed that much less sleep disturbances were experienced in fasting individuals. Contrary to the expectation of Kleitman<sup>14</sup>, individuals fasting during Ramadan showed increased mean duration of sleep as compared to the mean duration of sleep during non-fasting days. This could be the result of motivation and chiefly the spiritual involvement which prepares the fasting individuals to adapt for special alternation in the times and duration of sleep and keeps the individuals alert and interested in all other social and routine professional activities.

It is apparent that even within the limitations of the crude behavioural measures used in the present study, fasting Muslims found it necessary to spend variable sleep times presumably in order to meet the criterion of "satisfactory" sleep (Webb<sup>24</sup> & BaHammam<sup>25</sup>). How well this was accomplished can not be estimated from such a limited statistical study. It is likely, however, that intensive physiological studies of sleep profiles of fasting individuals for their sleep and naps may provide reliable data to accomplish sound and stable findings which may help to provide some satisfactory answers.

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