Yom Kippur headache

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Article abstract—Fasting is frequently mentioned by patients and in textbooks as a trigger for headache. In this study, we attempted to define the role of fasting as a possible precipitator of headache. Headache history was documented in 370 hospital employees (60% female) before and immediately after a 25-hour fast for the 1993 Day of Atonement (Yom Kippur). The population included 211 who fasted; 39% of fasters developed headache, compared with only 7% of nonfasters ($p < 0.000001$). Headache was usually of a nonpulsating quality, mild to moderate in intensity, and bilateral and frontal in location. Subjects with a history of headache were more likely to develop fasting-induced headache than were those without such history (66% versus 29%, $p < 0.000002$). The number of headache sufferers increased in direct relation to the duration of the fast. Caffeine and nicotine withdrawal and oversleeping did not appear to have an influence on headache development. We conclude that fasting is a strong headache precipitator, especially among chronic headache sufferers. It is usually nonpulsating and nonlateralized.

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Chronic recurrent headache, particularly migraine, manifests as repeated exacerbations against a background of prolonged pain-free periods. Many factors precipitate headache in susceptible subjects; these include the menstrual cycle,[1] changes in sleep pattern,[2] and certain foods.[3-7] Although fasting is frequently reported by patients to be a precipitating factor, it has not been formally evaluated. In the present study, we attempted to assess the role of fasting as a cause of headache by recording headache occurrence and characteristics during Yom Kippur, the traditional Jewish Day of Atonement fast. On this day Israel practically comes to a standstill. Observant Jews conduct a total fast, abandoning food, drink, and smoking for about 25 hours, starting just before sunset on the eve of the holiday. They do not work on this day and are expected to spend many of their waking hours praying. Many nonreligious Jews participate in this fast as well.

Methods. Several weeks before Yom Kippur 1993, members of the medical staff at our hospital and their family members were asked to complete a questionnaire detailing demographic data; drinking, eating, and smoking habits; and sleep and menstruation patterns. They were also questioned whether they suffered from headache and, if they did, about its characteristics, which were subsequently analyzed according to the International Headache Society criteria.[8] The aim of the study was not explained and was not obvious from the questionnaire. The responders (n = 370) were contacted again immediately after Yom Kippur, and relevant data—such as whether or not they had fasted, and information regarding headache and sleep patterns—were collected.

The participants in the survey consisted of 91 physicians (25%), 64 nurses (17%), and 74 members of the administrative team (20%) among hospital employees and also of 80 nonphysical workers (21%), 47 physical workers (13%), and 14 retired persons (4%) among their family members. The total population consisted of 220 females (60%) and 150 males and had an average age of 39 years (range, 17 to 81 years).

Results. Of the survey's 370 participants, 211 completed a full fast. Those who did not fast at all (n = 136) served as a control group. Excluded from the analysis were 23 persons whose fast was incomplete (not because of headache).

Chronic headache was reported by 101 (29%) of those screened; 52 (15%) were migraineurs, 45 (13%) suffered from tension-type headache, and four (1%) had other types of headache. During Yom Kippur, 82 (39%) of those who fasted suffered from headache, as opposed to only nine (7%) in the nonfasting group ($\chi^2 = 42.8$, $p < 0.000001$). The headache was described in most cases as bitemporal and/or bifrontal with a pressing quality and moderate intensity (table 1).

The onset of headache was directly related to the duration of the fast. Headaches first appeared after about 16 hours of fasting (ie, in the morning hours of the holiday), and additional headaches developed in other fasters later on (figure). However, 15 subjects developed their headache 30 to 60 minutes after the meal that concluded the fast.

Chronic headache sufferers were much more likely to develop headache during the fast than were those who had not reported chronic headache

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Table 1. Yom Kippur headache characteristics as described by 82 fasters who developed headache

Headache localization	Headache type	Headache severity
Bilateral 53/82 (65%)	Nonpulsating 69/82 (84%)	Mild 29/82 (35%)
Diffuse 22/82 (27%)	Pulsating 13/82 (16%)	Moderate 37/82 (45%)
Unilateral 7/82 (8%)		Severe 16/82 (20%)

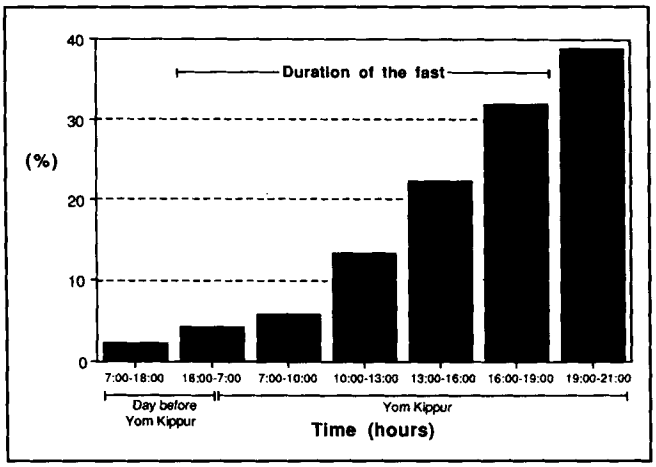

Figure. Cumulative headache frequency. The percentage of subjects in whom headache developed during the fasting hours (18:00 to 19:00) is represented by the columns. The percentage of subjects in whom headache developed before the beginning of the fast is shown in the first column, the percentage in whom headache developed from the beginning of the fast up to 7:00 on the morning of the holiday is shown in the second column, and the cumulative percentage of subjects in whom headache developed is shown at intervals of 3 hours during the fast in the remaining columns.

Table 2. Headache development during Yom Kippur in relation to oversleeping and chronic headache

Chronic headache	Oversleeping	Usual sleeping
Present (n = 58)	23/38 (61%)	15/20 (75%)
Absent (n = 153)	31/104 (30%)	13/49 (27%)

The numerators and the percentages in the second and third columns reflect the number and proportion, respectively, of fasters who developed headache during Yom Kippur among the total number of fasters (represented by the denominators) according to whether or not they overslept and whether or not they suffered from chronic headache.

Table 3. Coffee- or tea-drinking habits and their relation to headache development

Chronic headache	Cups consumed	Yom Kippur headache
Present	0-1 (n = 5)	2 (40%)
	2-4 (n = 39)	26 (67%)
	≥5 (n = 14)	10 (71%)
Total	n = 58	38 (66%)
Absent	0-1 (n = 17)	6 (35%)
	2-4 (n = 95)	26 (27%)
	≥5 (n = 41)	12 (29%)
Total	n = 153	44 (29%)

Sample sizes in the second column are for all fasting subjects. The figures in the third column represent the number and proportion of fasting subjects who developed headache during Yom Kippur among all fasting subjects according to the number of cups usually consumed and also in relation to whether the subjects suffered from chronic headache or not. The distribution did not support the hypothesis that a higher consumption of coffee or tea predisposes to development of headache during Yom Kippur.

(66% versus 29%; $\chi^2 = 22.4$, $p < 0.000002$). Moreover, photophobia, phonophobia, nausea, and vomiting accompanied the headache significantly more often among chronic headache sufferers than among those not reporting a history of chronic headache (39% versus 18%; $\chi^2 = 3.6$, $p < 0.05$).

Headache development was unrelated to the sex or age of the participants. Sixty-seven percent of male and 65% of female chronic headache sufferers developed headache. Similarly, among the chronic headache sufferers, 70% of those 40 years of age or older developed headache during Yom Kippur, compared with 63% of those younger than forty.

The majority of fasters (67%, versus 36% of nonfasters) reported oversleeping (by 90 minutes or more) during Yom Kippur. Headache developed in 38% of fasters who overslept and in 41% of fasters who did not oversleep (versus 4% and 8% among nonfasters). The distribution of those who developed headache according to whether or not they overslept and had chronic headache is presented in table 2.

We found that chronic headache sufferers who usually drink two or more cups of coffee or tea daily were somewhat more likely to develop Yom Kippur headache than those who do not habitually consume coffee or tea. However, this difference failed to reach statistical significance and was not observed among persons who do not usually suffer from headache (table 3). In addition, fasters did not report irritability or restlessness during the fast. Of fasters who habitually smoke, 35% (16/46) developed headache. Similarly, 40% of fasters who do not smoke developed headache (66/165). Thus, there was no connection between development of headache and sleep patterns, coffee or tea consumption, or smoking habits.

Discussion. Our study revealed that the vast majority (66%) of those suffering from chronic headache (migraine and other types) were influenced by the fast and developed a headache. The fast caused headache in a significant, but considerably smaller,

number (29%) of those not suffering from chronic headache. Fasting therefore is a strong headache precipitator.

There was a direct relationship between the duration of the fast and the cumulative number of subjects in whom headache developed (figure). After a "latent period" of 16 hours consisting largely of an overnight sleep, about 3% of fasters developed headache every hour. This raises the possibility that with a longer fast, even less vulnerable subjects will eventually develop headache. Our results do not support oversleeping as a major contributor to the development of fasting-related headache (table 2). Similarly, coffee withdrawal, a well-described headache precipitator,[9,10] also does not seem to play an important role in Yom Kippur headache (table 3).

Fasting headache might result from metabolic changes, such as hypoglycemia or the accumulation of certain metabolites. In a healthy person, the concentration of plasma glucose is maintained within a narrow range in spite of fasting or intermittent food ingestion. Hepatic glycogen stores are sufficient for at least 24 hours,[11] and since the majority of subjects who developed headache in the present study did so within 18 hours after commencing the fast, hypoglycemia is an unlikely cause of their headache. Supporting the absence of a causal relationship between hypoglycemia and headache are findings that (1) fasting headache can be provoked in the absence of hypoglycemia,[12] (2) insulin-induced hypoglycemia does not precipitate headache in migraineurs,[13] and (3) headache was not a complaint of patients arriving at the emergency room because of hypoglycemia.[14] Moreover, hypoglycemic headaches are pulsatile,[15] whereas the headaches in our subjects lacked vascular characteristics.

In 15 subjects, headache developed about 30 minutes after the meal that broke the fast. In this group, postprandial hypoglycemia might have occurred, or this group might have had a delayed effect of the fast that was manifested after the meal.

The Yom Kippur fast is possibly different from dietary fasts because it is held on a religious holiday and is associated with the emotion and tension of praying. Although we did not specifically address this issue, it should be taken into consideration when our results are compared with those of other studies.

The headache caused by the Yom Kippur fast was of a tension type in most cases, ie, bilateral, nonpulsating, and not severe; this was also the case in migraineurs. Vulnerability to headache precipitators probably varies among individuals, and chronic headache sufferers seem to be more easily influenced by provocative factors.

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