

## CLINICAL STUDY

## Deaths in the Turkish Hamam (Hot Bath)

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**Abstract:** Hamam (Hot Bath) culture is prevalent worldwide. The high temperature and humidity of these places have multiple effects on human health. The aim of this study was to investigate the demographic characteristics, autopsy findings and causes of death of cases who died in hamam and underwent medicolegal autopsies. The study was performed on 15 cases who experienced sudden death or died suspiciously in hamam and autopsied between January 1999 and December 2004. Eleven cases were men and 4 were women. Mean age was  $69.5 \pm 3.1$  and median age was 74. Eight cases were found dead in a bathtub or pool whereas seven were found out of water. Six of the cases older than 65 died in winter months. The causes of death were recorded as acute cardiac failure in 13 cases, pneumonia and cardiac failure in one, pneumonia and acute pancreatitis in the last case. Elderly patients with cardiac failure and coronary heart disease experience significant health problems in saunas and hamams. They should avoid this tradition unless approved by their physicians (Ref. 35). Full Text (Free, PDF) [www.bmj.sk](http://www.bmj.sk).

Key words: mortality, bath, autopsy.

Hamam (Hot Bath) culture is prevalent in our country as in others. The high temperature and humidity of these places (1, 2) have multiple effects on human physiology, particularly the autonomic nervous system and the cardiovascular system (3). Although there are many studies on the effects of the Finnish hot bath on the cardiac, respiratory, and cerebrovascular systems as well as rheumatologic diseases (2–8), similar studies on the effects of the Turkish hamam are scarce; various effects of high temperature and humidity have however been demonstrated in animal models (9). In this original study, the demographic characteristics, autopsy findings and causes of death of cases who died in hamam and underwent medicolegal autopsy were investigated in order to elucidate the factors that may have been related to their deaths.

**Methods**

The autopsy records of 3861 cases who underwent autopsy examination between January 1999 and December 2004 at the Council of Forensic Medicine of Bursa Morgue Department were reviewed. The study was performed on 15 cases (0.39 %) who experienced sudden death or died suspiciously in hamam which

is a common form of spa in our region and our country. The age, gender, macroscopic and microscopic findings of these cases were analysed.

**Results**

Eleven cases were men and 4 were women. Thirteen of them were older than 65; the youngest ones were 40 and 45 years old, the oldest was 80. Mean age was  $69.5 \pm 3.1$  and median age was 74.

Eight cases were found dead in a bathtub or pool whereas seven were found out of water. Six of the cases older than 65 died in winter months (December – February). External autopsy examination revealed cyanosis in their hand nail beds, lips and auricles in seven cases, maceration in the hands in one and skin abrasions or ecchymotic areas due to falling in the prominent areas such as the nose, forehead, elbow, lateral side of the arm, lateral side of the femoral regions and knees in five. Two people had previous surgical incision scars in the femoral and inguinal regions. Two cases had findings of putrefaction. One of the cases (40-year-old) had extensive neurofibromas and café-au-lait spots in the lateral waist and femoral regions compatible with neurofibromatosis; the death was reported to be due to pneumonia and acute pancreatitis. The weight of the hearts varied between 285 and 540 g, mean weight was  $397.3 \pm 18.5$  g, and median weight was 400 g. The wall thickness of cardiac compartments were recorded in 8 reports: [the right ventricle (min. 0.4 cm, max. 0.9 cm, mean  $0.65 \pm 0.06$ , median 0.65); the left ventricle (min. 1.3 cm, max. 2.5 cm, mean  $1.84 \pm 0.13$ , median 1.85)]. Macroscopic examination of the heart revealed atheroma plaques in all cases, atheromas had caused various degrees of obstruction in coronary arteries in 12 cases and there were fresh thrombi in the left anterior descending branch in 2 cases. Increased lung weight (min

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750 g, max. 2050 g, mean  $1311.36 \pm 117.96$ , median 1270) and oedema in lung sections were noted. Histopathological examination showed findings compatible with cardiac failure in the cardiac muscle fibers of nine cases and simultaneous occurrence of old and new myocardial infarction in five cases. All cases had anthracosis, emphysema and oedema; interstitial pneumonia was detected in 2 cases. Toxicological examination showed that there was no evidence of alcohol, narcotics or sedatives in blood or urine samples; no toxic substances were detected in internal organs. The cause of death was recorded as acute cardiac failure, pneumonia and cardiac failure, pneumonia and acute pancreatitis in 13, 1 and 1 cases, respectively; none of the cases found dead in water showed classical signs of drowning.

## Discussion

As is the case in many countries, hamams and hot springs are traditional in our country. Finnish and the Turkish hot baths are the most widely known types. Although there are differences between the two, their leading common feature is their high temperature (1, 2). In the Finnish bath, water is poured on the hot stones to develop humidity of 10 to 20 %; much higher levels of humidity occur in Turkish hamams (10). Adequate ventilation is provided in Finnish baths whereas continuous evaporation results in saturation in hamams (1, 2, 10). The first international scientific accounts on Turkish bath were published in England in the second half of the 19th century and the resulting discussions led to an increased interest in bath culture in other countries (11, 12). Although the multiple effects of hamams and saunas on human physiology, most prominently on the autonomic nervous system and the cardiovascular system, have been reported, most studies were conducted in saunas and there are no reports on Turkish hamam and deaths in these particular places (3, 11–13).

In a study on a series of consecutive sudden deaths in Finland, sauna deaths accounted for 2.6 % of the cases and coronary heart disease was the most important cause of death (14). In another study, the deaths in the first 24 hours of sauna treatment accounted for 1.7 % of all sudden deaths, and acute myocardial infarction precipitated by alcohol consumption in the setting of cardiac disease was strongly implicated (15); however, data from our country are lacked except for the present report.

The physiological effects of Finnish bath and Turkish hamam include increased dermal blood flow due to the increase in body temperature and the resultant decrease in blood flow to internal organs and increase in cardiac output and heart rate (1, 13, 16). As also observed in our study, elderly patients with history of cardiac failure and coronary heart disease experience significant health problems in saunas and hamams (2, 3, 5, 8, 15). Although some authors argue that hot springs have a role in congestive heart failure, there is no consensus, and controversial results have been reported (5, 6, 17–21). In principle, hamams and hot springs are not recommended for patients with congestive cardiac failure (2). Other cardiac contraindications include severe aortic stenosis, recent myocardial infarction, decompensated cardiac

failure and arrhythmias (2, 5, 22). On the other hand, Imamura et al emphasized that regular sauna treatment decreases the risk of atherosclerosis (23). Hemodynamic improvements in patients with history of heart failure and increases in left ventricle ejection fractions have been reported (24). In some clinical trials, it has been found out that acute cardiovascular changes in patients with stable coronary heart disease parallel those of healthy patients (25–28) and in prospective studies, it has been argued that in patients with stable coronary heart disease, deaths are not due to sauna treatment (29). Although Lurilla reported that in patients with recent acute myocardial infarction, hot bath cures were not associated with reinfarction and sudden cardiac death (25), signs of old and new myocardial infarction were found together in our series while one had a fresh coronary artery thrombus that caused a new infarction in the background of old infarction. The majority of sauna deaths in the Finnish series were due to coronary heart disease and acute myocardial infarction (14, 15). Ischemic changes were detected by electrocardiography and scintigraphy in the majority of patients with stable coronary heart disease after sauna cure (28). Sohar et al argued that coronary insufficiency may develop in the absence of prodromal symptoms (18). The cyanosis detected by inspection was valuable in relation to the abnormal hemodynamic changes in patients with cardiac failure; the hypertrophy and irregularity of the heart muscle fibers in histopathological examination was compatible with cardiac failure, which is in accordance with studies that do not recommend sauna treatment in patients with cardiac failure (5, 22, 24).

Studies on experimental models implicate an ill-understood, delayed increase in capillary permeability in animals exposed to high temperature and humidity (9). The exact pathophysiologic mechanism of delayed hemorrhagic diathesis and irreversible shock has not been elucidated. Investigation of enzymatic changes and coagulation processes may shed light to disseminated intravascular coagulopathy and rhabdomyolysis; changes in TNF and IL-6 receptors and electron microscopic examination are popular in studies on the endothelial inflammatory responses in environments with high temperature and humidity (19, 23, 30). In the study on cardiomyopathic mice by Ikeda et al, the authors showed that sauna treatment upregulated endothelial nitric oxide mRNA and was effective in endothelial vascular dysfunction (20). Similarly, Kihara et al reported increased endothelial function and amelioration of cardiac and clinical symptoms in patients with history of cardiac failure (19); Suguhara et al reported that sauna treatment increases urinary nitrate and nitrite levels in patients with cardiac failure (21).

The results of the studies on the effects of hamams and hot springs on blood pressure regulation in hypertensive patients are controversial. Although some authors achieved positive results, others reported that regulation can not be achieved in the majority of the patients (2–4). Although sauna treatment may result in various degrees of blood pressure changes, Winterfield et al (26, 27) and Vuori (13) reported that sauna treatment repeated at short intervals may increase the tolerance to heat, decrease the magnitude of blood pressure changes, and cold bath after sauna may

affect the sympathetic activation. Old people are at an increased risk of orthostatic hypotensive episodes and resultant syncope during baths (22). In the present study, inspection revealed skin abrasions on prominent parts of the body that may have been due to the falls after the syncope.

There are reports on the association between alcohol consumption and increased risk of cardiac arrhythmia and resultant sudden death in patients with varying severity of coronary heart disease and acute myocardial infarction (2, 7). Alcohol may precipitate hypotensive episodes and increase the risk of arrhythmia; it was emphasized that in patients with coronary artery disease, sudden deaths due to hyperthermia may occur (14, 15). It has been argued that sauna treatments may have harmful effects on patients consuming alcohol chronically and should be avoided by them (4, 5, 7). Alcohol was not detected in any of the cases in the present study; this may be due to the fact that most of the cases in this small series were older than 65. Beneficial effects of hot spring treatment on pulmonary conditions such as asthma and chronic bronchitis, various skin diseases and rheumatologic conditions have been reported (2, 31, 32). Hot spring treatment decreased pulmonary congestion, increased vital capacity and generally improved respiration in patients with asthma and chronic bronchitis (2, 33). Although Latinen et al (31) and Ernest et al (32) emphasized that regular sauna treatment decreased the incidence of acute respiratory disease; the cases with pneumonia in the present study suggest that such treatment should be avoided in the early stages of the infection. Press et al reported that in contrast with death due to cardiac causes in the elderly population, the majority of children's deaths were due to drowning (1). There were no drowning cases in the present study. Although not encountered in the present study, Papp et al reported frequent occurrence of thermal burns in patients who died in the sauna after consuming alcohol (34). Japanese investigators reported that hot bath deaths occurred more frequently in winter months and 80 % of the cases were elderly. The latter data are in accordance with the results in the present study (35).

In conclusion, elderly patients with history of cardiac failure and coronary heart disease comprise a risk group for sudden death in hamam and therefore should avoid this tradition unless approved by their physician.

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