

REVIEW OF CASES OF "EFFECTS OF HEAT" (HEAT-STROKE, ANIDROSIS AND HEAT EXHAUSTION) OCCURRING DURING THE HOT WEATHER OF 1929 AT ALLAHABAD.

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THE aim of this article is to record facts. For this reason signs, symptoms and treatment have deliberately been given small space, as this information can be found in any book on Tropical Medicine.

The period during which these cases occurred was from April 5, 1929, to July 5, 1929.

The total cases numbered twenty. They were all mild and no deaths occurred. They were as follows :—

	R.A.	Infantry	Others
Heat stroke (paralytic type)	1	—	—
Anidrosis (premonitory stage of heat stroke)	2	4	—
Heat exhaustion	—	11	1
Sunstroke	—	1*	—
Total	3	16	1

* This case occurred in April and is not included in the Meteorological Graph of the list of cases. It was purely a case of accidental sunstroke due to working at a bench in a carpenter's shop with the window slightly open. See list of cases.

PREDISPOSING CAUSES.

(a) *Constipation.*—Whether this can be called a predisposing cause or a symptom is hard to say. It was certainly present in every case except one who was suffering from boils and under treatment including mag. sulph.

(b) *History of Alcohol and Smoking.*—In perusing the personal histories of these cases, it will be seen that the great majority are very heavy smokers. The history of alcohol is difficult to obtain. A questionnaire was written out and sent confidentially to each man affected asking the amount of alcohol consumed daily. Their answers were not very reliable.

(c) *Length of Sojourn in the Country.*—Under 1 year, 5 cases ; from 1 to 2 years, 3 cases ; from 2 to 5 years, 9 cases ; over 5 years, 3 cases.

(d) *Past Illnesses.*—A review of the cases shows that 6 gave a history of malaria of recent date, 2 an unconfirmed history of malaria, 1 a history

EFFECTS OF HEAT CASES.

Serial number	Unit	Indian service	Age Years	Dates of		Disease	Barracks conditions				Alcohol H=heavy M=moderate	Tobacco	Previous illnesses
				Admission	Discharge		Fans	Punkahs	Lower floor	Upper floor			
1	Infantry	4 years	25	5.4.29	4.5.29	Sunstroke	Yes	No	Yes	No	Yes M	Yes	No record of any previous illness
2	Artillery	1 1/2 year	22	9.5.29	3.6.29	Anidrosis	No	Yes	No	Yes	" "	"	Old "injury" to head" (not in service)
3	"	2 years	21	18.5.29	26.6.29	Heat stroke	"	"	"	"	" "	"	"
4	Infantry	5 "	36	24.5.29	26.6.29	Heat exhaustion	Yes	No	"	"	Yes H	"	Malaria B.T. ; several attacks. Tonsillitis
5	"	4/12 year	23	2.6.29	26.6.29	" "	No	Yes	"	"	No	"	No record of any previous illness
6	"	2 years	22	7.6.29	15.6.29	Anidrosis	Yes	No	Yes	No	Yes H	"	" " "
7	"	5/12 year	20	7.6.29	15.6.29	" "	"	"	"	"	No	"	" " "
8	"	6 years	25	8.6.29	26.6.29	Heat exhaustion	No	Yes	No	Yes	Yes M	"	Severe malaria—Kasauli case ; also boils
9	"	4/12 year	18	10.6.29	22.6.29	Anidrosis	"	"	"	"	No	"	No record of any previous illness
10	"	4 1/2 years	27	12.6.29	28.6.29	Heat exhaustion	Yes	No	"	"	Yes M	"	Malaria
11	Artillery	1 year	22	12.6.29	26.6.29	Anidrosis	No	Yes	"	"	No	"	? Malaria. Did not report sick. No record of any previous illness
12	R.A.O.C.	4 1/2 years	34	12.6.29	20.6.29	Heat exhaustion	Yes	No	"	"	Yes M	"	Malaria B.T. ; several attacks
13	Infantry	6/12 year	19	13.6.29	22.6.29	" "	No	Yes	"	"	No	"	No history of illness
14	"	4 years	24	13.6.29	1.7.29	" "	"	"	"	"	Yes M	"	" " "
15	"	2 "	23	14.6.29	2.7.29	" "	"	"	"	"	No	"	Malaria B.T. once, 1928
16	"	2 "	18	3.7.29	8.7.29	" "	"	"	"	"	Yes M	"	? History of malaria. Did not report sick. No other record
17	"	4 "	25	4.7.29	10.7.29	Anidrosis	"	"	"	"	" "	"	No record of any previous illness
18	"	8 "	26	5.7.29	8.7.29	Heat exhaustion	"	"	"	"	" "	"	Malaria
19	"	5/12 year	21	5.7.29	8.7.29	" "	"	"	"	"	" "	"	One admission for headache, 1929
20	Q.A.I.M.N.S	1 1/2 "				" "	Sisters' duty room on top floor						Boils. On night duty two weeks prior to admission

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of old injury to the head, and 2 gave a history of boils, 1 a history of severe headache.

(e) *Occupation.*—The men's occupation does not seem to call for any special comment except in the following cases:—

One anidrosis, occurring in a gunner working in the gun park shed. Two cases of heat exhaustion, one of these was working in the workshop at the Arsenal, while the other was cycling from the Fort to the cantonment at 11 a.m. The remaining cases were following their ordinary routine.

(f) *Influence of Type of Quarters.*—The marked feature in these cases, is the number of men affected who sleep in an upper room; sixteen slept in the upper barrack room, while three slept on the ground floor. The remaining case was a sister who was on duty in the hospital (her duty room was on the upper floor).

METEOROLOGICAL CONDITIONS.

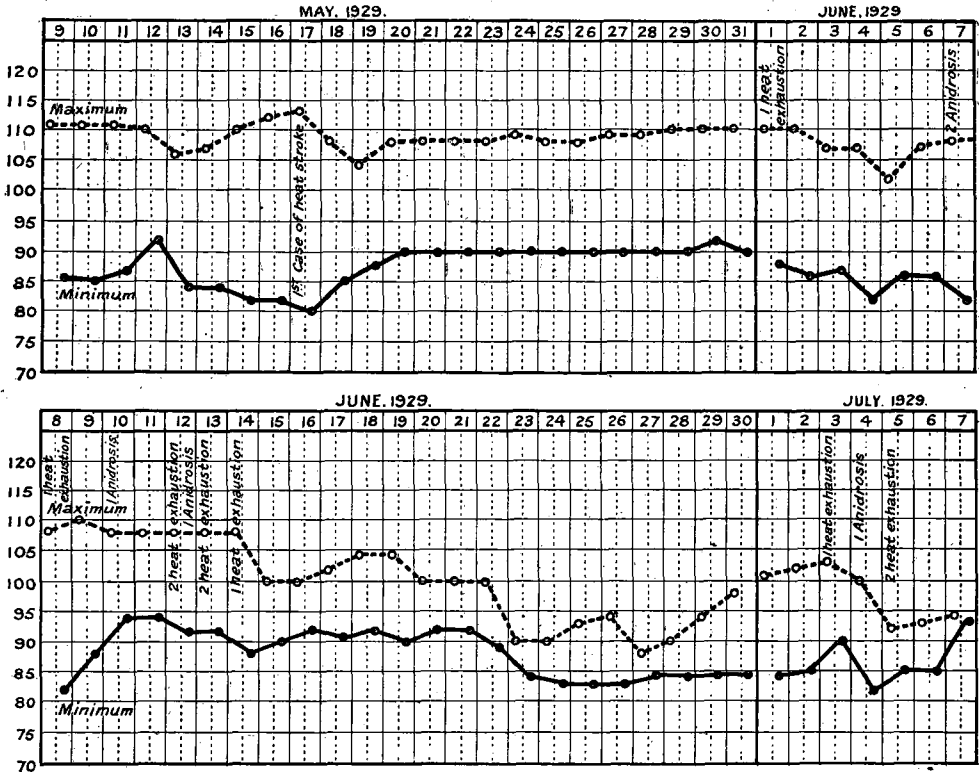
There seemed a definite relation between the constant high mean temperature and cases of "effects of heat." The wet and dry bulb readings however coincided with the danger points given in all books on tropical medicine and these readings must remain our main warning.

For sixteen days before the first case of heat-stroke the maximum temperature had ranged from 105° to 113° F., whereas the minimum was never below 84° F. The lowest wet bulb reading reached 66° F. for one day, and averaged 75° F., whereas the dry bulb reading had never been below 90° F.

No cases occurred when: (a) the wet bulb reading was below 75° F. and the dry bulb reading below 88° F.; (b) the lowest maximum daily temperature was below 100° F.; (c) the lowest minimum daily temperature was below 80° F.; the lowest mean temperature below 94° F.

It was noticed that patients in the upper wards frequently ran very high temperatures without any real cause and in addition "heat cases" were difficult to nurse owing to their proneness to hyperpyrexia. This became so apparent that all heat cases were removed to lower wards. It was thought that perhaps the louvres (wooden screens) around the verandahs were partly the cause of the great heat in the wards. To prove whether this was the case or not, an experiment was carried out as follows: The temperature readings of the verandahs around the north and south wards were taken for a week and the south ward was slightly hotter. Next the louvres from the west verandah of the south ward were removed and night readings were again taken in the verandah and compared with readings of the west verandah of the north ward. It was found that actually the south ward was hotter than the north, though the patients and staff both declared that they considered the ward much cooler after the louvres were removed. However, the temperature readings were taken for three weeks

and proved beyond doubt that the louvres reduce the temperature slightly. (See attached chart.)



Daily maximum and minimum temperatures during May, June and July, 1929.

CLINICAL SIGNS AND SYMPTOMS.

Heat Stroke Case.—There was only one case of heat stroke (paralytic type). This patient gave a history of a head injury some years ago. His maximum temperature reached 105°F., he was unconscious for four hours; pupils, contrary to the usual teaching, remained widely dilated throughout his unconscious period, and never in fact became contracted at all. He gradually recovered after treatment by intravenous and rectal saline—the spleen was not enlarged—his blood was negative to malaria, but he was given an injection of quinine as a precautionary measure. There was no previous history of malaria in this case. He made a complete recovery.

Heat Exhaustion Cases.—These heat exhaustion cases showed a fairly definite typical course, the most notable features being the cardiac irregularity coupled with hæmic murmur, and in some cases slight cardiac dilatation. The question whether this cardiac condition is entirely secondary to the disease or a predisposing cause has to be considered, and is of great importance in routine examination of the men before the hot

weather. The other signs and symptoms were constipation, giddiness, shortness of breath, headache, cold and clammy skin, with in some cases a history of dry skin and inability to sweat for several days, extreme lassitude and a feeling of sleepiness for days after admission; cramps were present in a number of cases varying from slight abdominal colic to actual abdominal and other muscle cramps. The temperature of these cases soon reacted, but it was noticed in many instances that a slight irregular low fever was present for a few days after the first signs of reaction.

Anidrosis Cases.—These were really heat stroke cases in the premonitory stage characterized by the following signs and symptoms: headache, dull pain behind the eyes; giddiness, severe constipation, furred tongue, inability to sweat, with a dry skin (sandy to the touch), and a very pungent odour from the mouth. They were troublesome cases, ran very irregular temperatures, in fact were always threatening heat strokes. These cases had to be nursed in a ward downstairs next to the heat-stroke room as it was found that in the upper wards they were very prone to bouts of hyperpyrexia and showed marked and rapid improvement after removal to the lower wards.

Suggestions for the prevention of "effects of heat" in Allahabad:—

(1) That the hospital upper wards be used as little as possible from May to August.

(2) That a light type of charpoy bed be furnished for troops so that a greater number can sleep out of doors (at present troops in upper barrack rooms can never sleep out owing to the difficulty in moving heavy beds). This would also enable men to sleep indoors during dust storms.

(3) The question of diets should once again be thoroughly investigated. The present diet seems quite unsuitable for the plains in the hot weather, and is without doubt a cause of constipation. Perhaps an experiment could be made by devising a diet containing a certain amount of European essentials with more vegetables, and in addition a richer supply of tropical food ingredients such as dhal, rice, atta, thus increasing vitamins.

(4) The last two hours of sleep from 4 a.m. to 6 a.m. are the most beneficial, and early rising after a hot and restless night must assuredly gradually lower one's resistance. Lack of sleep is a great cause of general lack of mental and muscular tone and therefore a predisposing cause of constipation.

It is suggested that Reveille could be arranged at a later hour from May to October than it is at present.

An issue of purgative salts twice a week. This was carried out in the battalion here for one month during the hot weather, and we feel sure acted beneficially.

CLOTHING.

The present type of grey-back shirt is very thick and too hot altogether. In this connexion it is interesting to note that out of the total number of "Effects of Heat" cases, 16 British Infantry and 3 R.A. (2 anidrosis,

1 heat stroke) the R.A. unit had not a single case of heat exhaustion, the fact that their men wore a thinner type of khaki shirt may have been the reason.

The present type of spine pad in use seems of doubtful value; it does not protect the nape of the neck unless continually readjusted; it is very thick and when the troops are on the march they invariably cross their equipment straps over it, and thus it acts as a poultice down the back and prevents evaporation; tight thick belts are worn round the waist. The puttees are very thick and the boots heavy. The sum total of this is a lack of evaporation from the body surface except for the thighs and the open neck, which is a small total body surface area.

The weight of the clothing also must be an important factor in fatigue exhaustion. We suggest lighter and looser leg wear, a stocking type puttee which is both efficient and smart, and a lighter boot. A light helmet neck shade stretching down to the level of the spine of the scapula. To please those who believe in spine pads, a thinner type of spine pad seems indicated. It is to be noted that during the entire hot weather the gunners only wore light khaki shirts while the Infantry kept to their heavy "grey-backs." Could not the infantry fall in line with the gunners in this respect? We realize fully that the present type of clothing is most unlikely to be altered, but at the same time we cannot pass over clothing when writing an article on the "Effects of Heat," as clothing is after all recognized as being an important factor in the production of heat exhaustion and heat stroke.

