Age as a causal factor in heat stroke

by N. B. STRYDOM* Ph.D., (Illinois), (Fellow)

SYNOPSIS

The data on heat stroke cases reported during the past five years were examined to determine the influence of age on the incidence of heat stroke. Relating the age distribution of these cases to that of the total number of Bantu mine workers showed clearly that the older men run a significantly higher risk of developing heat stroke than the younger men. Although the number of Bantu over 40 years of age in the industry is less than 10 per cent of the total they nevertheless accounted for 50 per cent of the fatal heat stroke and 25 per cent of the non-fatal heat stroke cases during the period under review. Age must, therefore, be recognised as a causal factor in heat stroke and the worker over 40 years of age should be allocated to work on surface, or in cool areas or to non-strenuous and supervisory tasks in hot areas.

INTRODUCTION

The understanding and appreciation by all concerned of the causal factors of heat stroke would not only contribute to the decrease or even prevention of this condition but also improve the chances of recognition of heat stroke once it has occurred. Facilities underground are such that once the symptoms of heat stroke have been recognised the patient can be treated on the spot and the sooner such treatment is applied the better the chances of his complete recovery[10].

In several surveys of the heat stroke position in the mining industry and in other publications[5, 9, 11] attention was drawn to causal factors such as high environmental temperatures, high work rates, loss of acclimatization, lack of enough drinking water, illness, alcohol intake, etc. The age factor had also been mentioned but observations on 59 Caucasian miners in the age range 25 to 44 years failed to show any effects of age on physiological parameters measured during heat stress[9]. It was, however, shown that men with low maximum oxygen intakes developed higher body temperatures during heat stress than those with high work capacities. Furthermore, there is enough evidence in the literature to indicate that maximum oxygen intake decreases with age[1, 7] and that age is a significant factor in the susceptibility of the general population to heat stroke[2, 3].

In order to clarify the position regarding the older Bantu working underground and his susceptibility to heat stroke the information collected on the heat stroke cases that occurred during the period January 1965 to December 1968[5] was re-examined. The information on all the cases reported during 1969 was also included.

METHODS

The methods employed for the collection of the data on heat stroke cases in the mining industry have been described in detail elsewhere[5]. For this analysis all the case reports were re-examined to establish whether the age of the patient was specified. Where available the age and the outcome of the condition were recorded. The ages of the patients were taken from passports, work pass records or obtained by questioning.

The information on age distribution of Bantu mine employees was obtained from the tuberculosis survey conducted in 1963/64 and reported upon by Dr J. G. D. Laing[6]. Basically the age distribution as given in Dr Laing's Table 21 has been used. The 42 622 Bantu grouped in this Table represent employees from five Anglo American mines at Welkom and include Bantu from the Transkei, R.S.A., Swaziland, Botswana, Mocambique, S.W.A., Lesotho, Zambia and Malawi. The relevant number or percentage of men from each territory were not given in the Table.

RESULTS

Of the 94 non-fatal and 19 fatal cases that occurred during the period under review information on the ages was available on 84 and 14 cases, respectively. The age distribution of these cases is given in Fig 1. Seven of the 14 fatal and 21 of the 84 non-fatal cases were older than 40 years. Also included in Fig 1 is the age distribution of mine employees as given by Dr Laing for five Welkom mines in 1963-1964[6]. The distribution is skewed towards the older age groups with the majority (70 per cent) of Bantu labourers below 30 years of age and only 8,5 per cent older than 40 years.

*Human Sciences Laboratory, Chamber of Mines of South Africa, Johannesburg

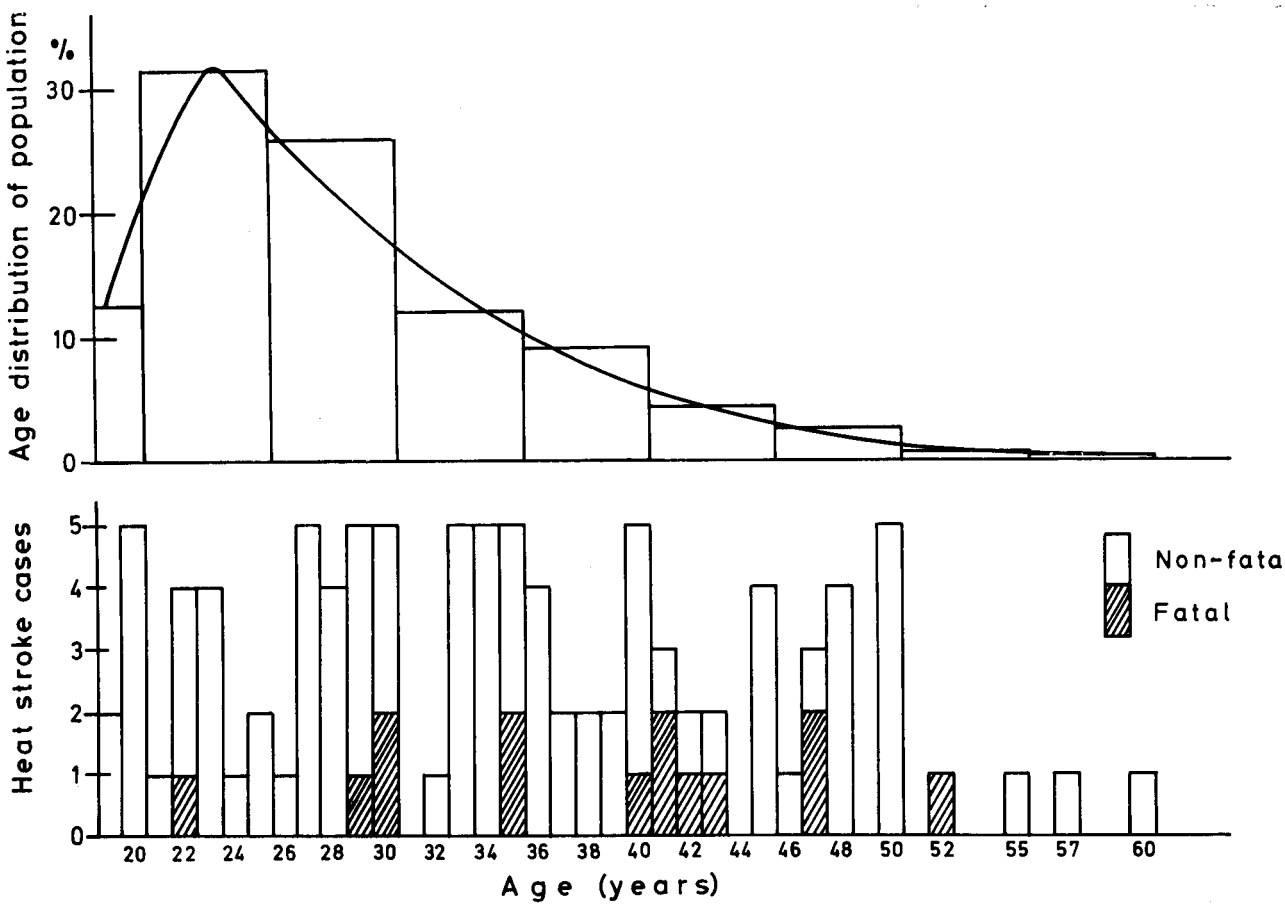

Fig 1—Age distribution of fatal and non-fatal heat stroke cases, and the age distribution of the population

From these data as well as those given by Kok *et al*[5] in their Table VII, the approximate incidence of heat stroke per 100 000 men in the different age groups was calculated. The results are given in Fig 2 which shows that the risk of heat stroke is the lowest for the age group 21-25 years, being only 2/100 000. The heat stroke risk steadily increases with age and reaches a level of 22/100 000 for men over 46 years of age.

DISCUSSION

The data in Figs 1 and 2 indicate clearly that Bantu men over 40 years of age are very susceptible to heat stroke. Although they constitute only about 8,5 per cent of the mine population their contribution to the total number of fatal heat stroke cases is 50 per cent of the sample under investigation. No less than 29 per cent of the total heat stroke cases, fatal and non-fatal, were found to be above 40 years of age. The fact that Wyndham *et al*[9] found no difference in heat tolerance between young and old subjects must therefore be ascribed to their inclusion of men of 33 years and older, in the older age groups.

These findings are in line with those reported by Ferris *et al*[2] and Gold[3] who found that old age and degenerative diseases play a major role as precipitating factors in heat stroke. Hellon and Lind[4] provide some background to the understanding of this observation. They subjected groups of young (18-23 years) and old men (44-57 years) to a heat stress and observed that the sweat glands of the older men were more sluggish in response to environmental and metabolic heat loads. The older men, therefore, developed higher body temperatures than the younger age group.

A further explanation may be found in the fact that older men tend to have lower working capacities than young men[1, 7]. Wyndham *et al*[9] have shown that low work capacity men are at greater risk during heat exposure.

It may be argued that the age distribution used for teh Bantu employed underground is not representative for the industry as a whole or that the figures for 1963 to 1964 are not applicable to the period under review. The 8,5 per cent for men over 40 years for the O.F.S. sample are, however, very similar to the 8,3 per cent given for a mine on the West Rand in Table 18 of Dr Laing's report. Also, if any major change in age distribution did occur over the past few years it would, because of labour shortages, have been towards the increase in the percentage of the younger age groups. The previous weight limitation of 110 lb applied by W.E.N.E.L.A. in the selection and acceptance of raw recruits was relaxed in 1965 and Strydom[8] suggested that this could lead to the employment of Bantu who are actually below the stipulated 18 years of age. If the percentage of men over 40 years of age is less than 8,5 per cent of the total

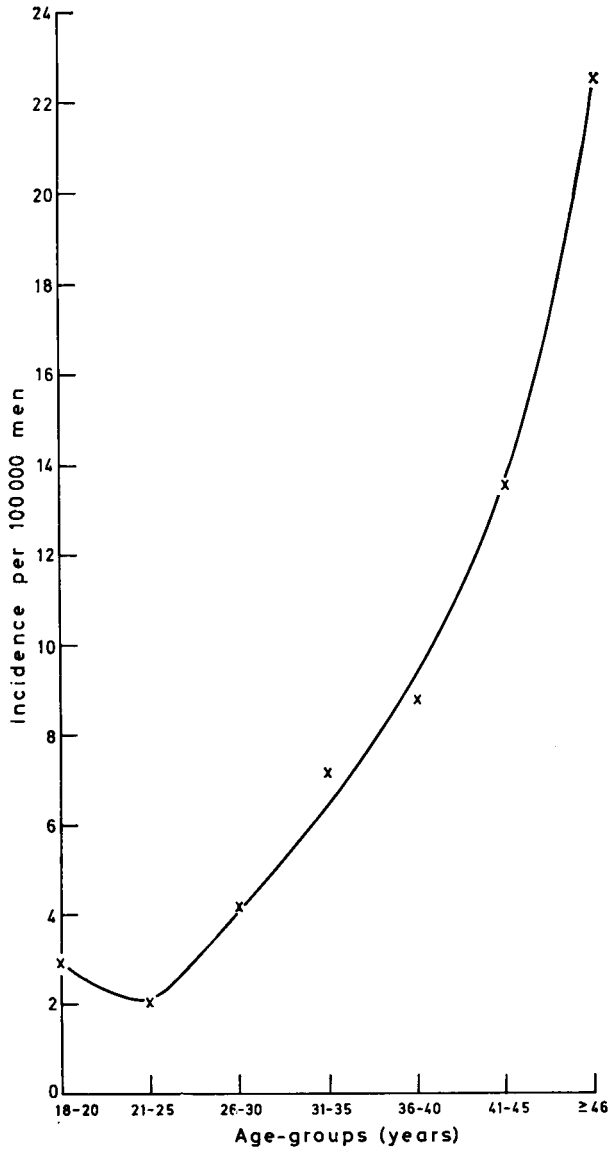

Fig 2—Incidence of heat stroke in relation to age-groups

mine population then the risk of these men developing heat stroke is even more serious. Further, it is generally known that the majority of the Bantu working in the gold mining industry in South Africa are below 30 years of age. These men come initially to the industry from their homelands in order to earn lobola. They work for periods of 12 to 18 months and subsequently return for a further 4 or 5 contracts. It has been a matter of concern to the industry that the older and experienced labourers do not return for further spells of employment but this may have its hidden advantages as shown by the results of the investigation reported on here.

These results show that age must be regarded as an important causal factor in heat stroke. Men over 40 years of age run a far higher risk of contracting heat stroke than those who are less than 40 years of age. It would therefore, seem advisable for mine managements not to employ the older Bantu on such strenuous tasks as shovelling or tramming rock in hot areas of mines. These men should be given surface jobs, be employed in the cooler areas of the mine, or reserved for supervisory work in which their basic skills, training and experience would be of great value to the industry.

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