Serum alkaline phosphatase values in normal adolescents

G. SERENY, M.D., C.R.C.P.[C] and L. MCLAUGHLIN, B.SC., *Toronto*

Alkaline phosphatase determinations measured during an investigation of a group of adolescents (12 to 16 years of age) were considerably higher than expected. In various reference books the normal range of alkaline phosphatase activity at this age is not precisely defined. The normal range for adults varies between 2 and 14 King-Armstrong units[1-4] and under the age of 10 years it is distinctly higher, from 15 to 30 K.-A. units. Values in the age group 10 to 16 years are listed in only one reference work[5] where it is suggested that the upper normal limit is 20-25 K.-A. units. Personal communication with pediatricians and biochemists from The Hospital for Sick Children, Toronto, elicited that they consider values up to 20 K.-A. units normal and anything over 25 units definitely abnormal. Because of this paucity of information regarding normal alkaline phosphatase values in adolescents, a pilot study was carried out in this laboratory. Fifty-five healthy male adolescents aged 12 to 16 years were included in the study. They were volunteers from three different schools, and according to their own statements had not been exposed to hepatotoxic drugs and had no history of hepatitis. Physical examinations on the day of testing were normal. With the subjects fasting, blood was withdrawn and assayed in duplicate for alkaline phosphatase by the King-Armstrong procedure.[6]

Results

The range of alkaline phosphatase values in this group was between 5 and 47 K.-A. units (Fig. 1) with a mean of 20 and a standard deviation of 7.5. Using 95% confidence limits the normal range in this particular group would be between 5 and 35 K.-A. units.

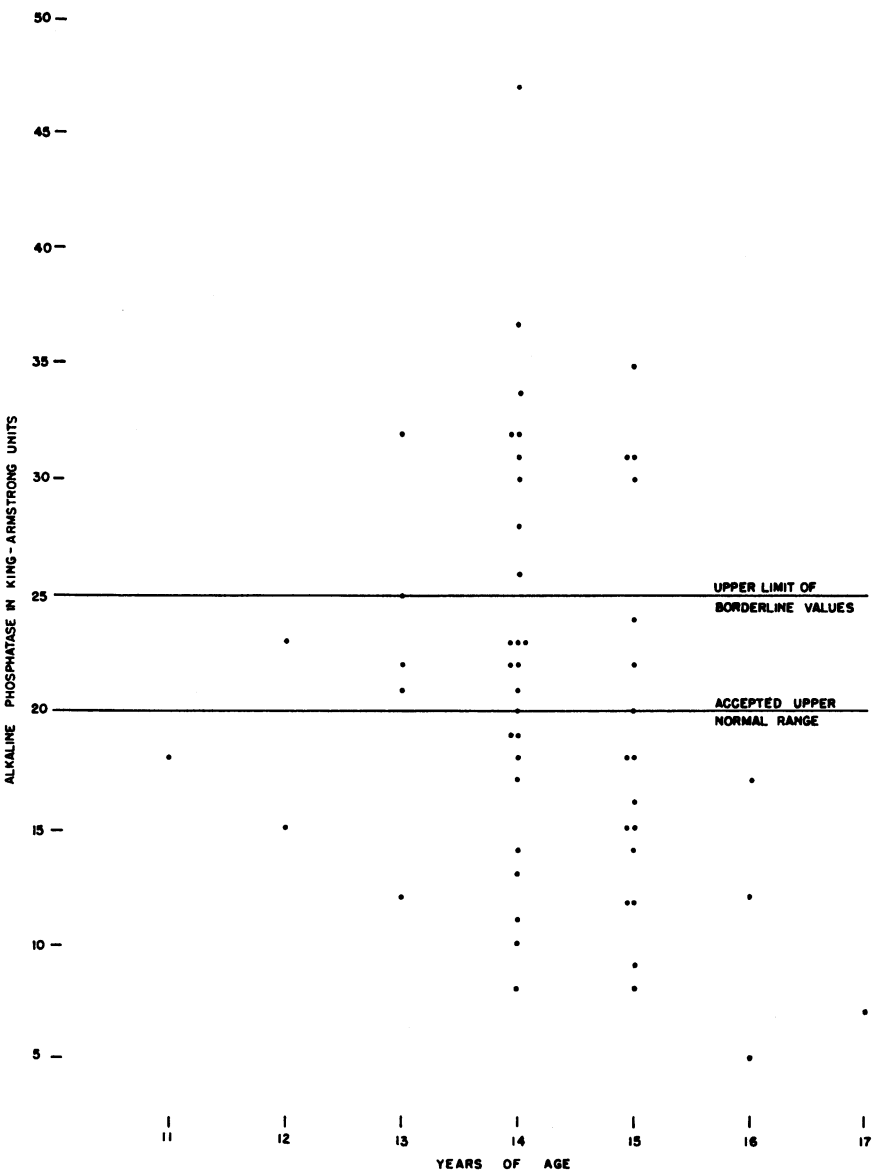

FIG. 1—Scatter diagram of alkaline phosphatase in 54 normal adolescents.

From the Laboratories of the Alcoholism and Drug Addiction Research Foundation of Ontario, Toronto, Ontario.

Reprint requests to: Dr. G. Sereny, Director of Laboratories, Alcoholism and Drug Addiction Research Foundation, Medical Unit, 14 St. Matthews Road, Toronto 8, Ontario.

Discussion

Normally a certain amount of phosphatase with a pH optimum of 8.5 to 9.5 circulates in the plasma. Its origin is believed to be the osteoblastic cells of bone. The concentration of the enzyme tends to remain constant, but rises in certain conditions associated with enhanced osteoblastic activity or in obstructive liver disease. Thus the determination of serum alkaline phosphatase concentration becomes an important diagnostic aid in clinical medicine.

Since the growing process is associated with increased osteoblastic activity, alkaline phosphatase values can be expected to be higher in healthy adolescents than in adults. The results of the present study would support this hypothesis. This fact, however, is not well recognized in clinical medicine, and being unaware of it could lead to an erroneous diagnosis based on a presumed elevated alkaline phosphatase. There appears to be no correlation between age within the period of adolescence and high alkaline phosphatase values (Fig. 1). This is not surprising, since there is a great individual variation in the growth process and in the age at which this occurs. Nevertheless, establishment of the normal range of alkaline phosphatase values in the age group 12 to 16 years is of importance. The number of subjects included in this study is not large enough for this purpose and we suggest that a survey on a larger scale be carried out.

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