

C is not known with certainty, but it would appear that the essential pathological change in scurvy is a weakening of the endothelial walls of the capillaries due to or accompanied by a reduction in the amount of intercellular cement substance.¹² It cannot be definitely stated that lesser degrees of avitaminosis C, short of scurvy, have a similar but slighter effect in weakening the walls of capillaries, although theoretically this is possible. If true, vitamin C deficiency should have an important place in the causation of capillary rupture with intimal hæmorrhage and in the precipitation of coronary thrombi. An attempt has been made during the past seven months to determine the level of vitamin C nutrition in public ward patients, and to correlate this with clinical evidence of coronary occlusion and other diseases.

The material consisted of 455 consecutive admissions (adults) to the public medical wards of the Ottawa Civic Hospital from February 16, 1940, to September 1, 1940. On the second day of hospitalization 7 c.c. of venous blood were withdrawn fasting from each patient, and placed in a test tube with 2 drops of 20 per cent potassium oxalate and 2 drops of 2 per cent potassium cyanide. The test tube was firmly corked, shaken and sent to the laboratory where an estimation of the vitamin C content was done as soon as possible. The method used was that described by Farmer and Abt,¹³ using titration with indophenol. The clinical diagnosis on each case was obtained at a later date. In cases of coronary thrombosis the diagnosis was made on a typical history and physical signs, plus electrocardiographic confirmation in most cases. In this study the blood plasma vitamin C concentration was used in preference to the vitamin C storage level, first, because it was more practicable, and, secondly, because it represents a measure of the immediate nutritive level of the vitamin.

A number of interesting points were noted in the series. First, a marked degree of vitamin C deficiency in public ward patients was noted—55.8 per cent of cases showed a fasting level of less than 0.5 mg. per 100 c.c. of plasma, the lowest limit of normal by most investigators.¹⁴ If 0.4 mg. per cent is taken as the lowest limit of the normal,¹⁵ 29.9 per cent of the series were below this level. The degree of deficiency was practically the same in young adults as in older individuals. The high incidence of inadequate vitamin C blood concentration in public ward patients is not surprising considering their financial status, but it has been shown by Croft and Snorf¹⁶ that a similar degree of deficiency exists in private patients, particularly those with gastro-intestinal disturbances.

A definite seasonal variation in the blood plasma vitamin C concentration was noted in the series, 65 per cent of the cases were below

0.5 mg. per cent in February, March, April and May, while only 42 per cent of the cases were below 0.5 mg. per cent in the summer months (June, July, August). The rise in the general level of blood vitamin C concentration during the summer coincides with the influx of cheap fresh vegetables and fruit on the market.

The relation of blood plasma vitamin C concentration to disease was more difficult to evaluate. However, a striking feature in the series was the low concentrations noted in most of the patients with signs and symptoms of coronary occlusion, 81 per cent of the cases showing a concentration below 0.5 mg. per cent. This high incidence of vitamin C deficiency was not reached by any other type of disease in the series. Even gastro-intestinal diseases, including peptic ulcer, showed a higher vitamin C level on the average than did coronary occlusion, and this is surprising when one considers the effect of gastro-intestinal dysfunction on diet. Cases of indefinite coronary thrombosis and of cerebral thrombosis also showed a pronounced grade of vitamin C deficiency, although somewhat less than that in the definite coronary occlusion group.

It was interesting to compare the seasonal incidence of coronary thrombosis as established by Bean and Mills,¹⁷ with the average blood plasma vitamin C concentration of public ward patients during the winter and summer months. Coronary occlusion has been established to be more frequent in the winter than in the summer, and, as has been shown here, the average blood plasma vitamin C concentration is lower in the winter than in the summer. This finding, in association with an almost constant low blood vitamin C concentration in cases of coronary occlusion, suggests a reason for the seasonal variation of the disease. The seasonal variation in coronary thrombosis may also be due in part to the fact that every period of passing cold is associated with an increase in blood pressure (W. F. Petersen).

The evidence presented here suggests that a deficient blood plasma vitamin C concentration may increase capillary fragility and thus play a part in capillary rupture, intimal hæmorrhage, and precipitation of coronary thrombi. However, as Abt and Farmer¹⁸ remark, the whole field of vitamin C nutrition is but in its infancy, and much more experimental and clinical evidence must be accumulated before any