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ASCORBIC ACID STATUS IN INSTITUTIONALIZED AND NON INSTITUTIONALIZED MENTALLY RETARDED PEOPLE

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Introduction

There has been an increased awareness about the relationship of nutrition to mental retardation since the 1960's especially with the study of Cravioto and Robles (1965) on the influence of protein calorie malnutrition on psychological test behaviour. Biological, psychological and social factors contribute to nutritional deficiencies in the mentally retarded subjects. These include physiological inadequacies such as defective oral and gastrointestinal function due to congenital abnormalities, birth defects, infections etc. in addition to inadequate intake, problems in feeding necessitating the use of over cooked food from which vitamins and minerals are lost and concomittant use of certain drugs (e.g. anticonvulsants).

Ascorbic acid is one of the water soluble vitamins which plays a major role in the synthesis of collagen. Human beings, unlike most animals, are unable to synthesise L-ascorbic acid as a result of which they have to depend solely on their dietary intake of vitamins. Recommended daily amounts (RDA) of ascorbic acid is about 30mg for adults (Department of Health & Social Security, UK, 1985).

Matin *et al.* (1981) in a study on vitamin status in Down's syndrome found that 60% of the subjects had values within normal range for fat soluble vitamins A and E whereas only about 30% had normal values for the water soluble vitamins thiamine, nicotinic acid and ascorbic acid. Other authors have also found lower levels of vitamin A, folic acid, riboflavin (Cole *et al.*, 1985) pyridoxin (Ellman, *et al.*, 1986) and other

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minerals in mentally retarded individuals.

Population

The present study concerns the effect of ascorbic acid as a reducing substance in the urine of normal controls (n = 24) and of retarded persons in the community (n = 14) and in an institution (n = 14). The mentally retarded were clinically classified as mildly, moderately or severly retarded. Subjects between the age group 18 and 45 were randomly included in the study. The mean age for the institutionalized subjects was 36. There were 8 males and 6 females. 2 subjects were mildly retarded, 7 were moderately retarded and 5 severley retarded. In the other group the mean age was 28 and the sex ratio was equal. Two subjects had mild retardation, 9 had moderate and 3 had severe retardation. 24 non retarded individuals randomly selected from the hospital staff constituted the control group. The mean age in this group was 32. There were 11 males and 13 females. Subjects with obvious G.I.T. disturbances, serious physical illness and those on medication that interact with the test were excluded from the study.

Ascorbic acid saturation test was carried out in all the subjects using Dichlorophenolindophenol tablets as follows. Patients were given a test dose of 300mg ascorbic acid at 8 a.m. after micturition. Samples of urine were collected after 4 hours. One Dichlorophenolindophenol tablet is dissolved in 30 mls of distilled water which turns the solution blue, to which exactly 20 mls of the urine is added. If the blue colour is discharged within 30 seconds, hypovitaminosis is not present. If the test solution remains blue for more than 30 seconds, the patient has some degree of deficiency.

Results

All but one of 24 controls had indirect evidence, by the test employed, of adequate levels of vitamin C in the body, whereas the urine of five institutionalized and four non-institutionalized retarded persons contained inadequate ascorbic acid suggesting a vitamin C deficiency. The deficiency in ascorbic acid status among institutionalized and community based mentally retarded subjects was highly significant when compared with the control group ($P<.0001$). However the difference between those from the residential as compared to community setting was not statistically significant. Also we did not find any correlation between ascorbic acid deficiency and severity of mental retardation or the etiology of retardation.

Discussion

In view of the deficient nutritional status in mentally retarded subjects, some authors have studied the effect of vitamin - mineral supplements on intelligence. There is one study that has reported a significant increase in IQ after vitamin - mineral supplements (Harrell *et al.*, 1981). However a more recent study by Ellman *et al.* (1984) and various other investigators have failed to replicate this finding. Wilton *et al.* (1983) found that

the socioculturally retarded children's intake of iron, calcium, thiamine and ascorbic acid was below U.S. National Academy of Sciences, National Research Council recommended daily allowance levels when compared to non retarded children of low socioeconomic status. A reduced intake of ascorbic acid was considered to be at least in part responsible for the low blood concentration in psychiatric inpatients by Schorah *et al.* (1983). Nutritional deficiency has been described by other authors in long term hospitalised psychogeriatric patients (Hontela *et al.* 1983). In this study the dietary intake for all three groups were analysed for its nutritive value and the ascorbic acid level was found to be well within the normal recommended range. It may be argued that institutionalization decreases the number of external stimuli followed by lack of motivation and spontaneous activity which in turn adversely influence their extra dietary intake of supplementary food which will render the hospital population more vulnerable to vitamin deficiency despite adequate nutritional supplements. However in our study no difference in ascorbic acid status was found between institutionalized and non institutionalized subjects.

Hospitalised patients had the advantage of expert clinical and dietetic advice unlike their counterparts in the community, although the dietary requirements of both the groups are more or less the same. Therefore one would expect the institutionalized subjects to be better in their nutritional status than those living in the community. However our data does not support this. Also the issue of reduced intake does not seem to be a likely possibility in our study since the dietary intake was carefully supervised by the staff. One way of explaining this rather unexpected finding is to consider that the deficiency in ascorbic acid status is caused by malabsorption than by dietary deficiency. Matin *et al.* (1981) suggested that the low levels of water soluble vitamins found in the mentally retarded could be the result of malabsorption. Auld *et al.* (1959) found that there was malabsorption of vitamin A in mentally subnormal subjects. These evidences in addition to our findings suggest that factors other than insufficient dietary supplement, institutionalization and inadequate intake may be playing an important role. The most likely explanation being due to malabsorption, though it remains to be shown whether this is associated with any sub clinical abnormality of the intestine.

Ascorbic acid is generally thought to be a vitamin that is readily absorbed. If this is true, one could speculate that there are other reasons for the low levels. It may be that the mentally retarded subjects have metabolic - endocrine patterns different from the intellectually average individuals. Also an association between ascorbic acid deficient status and a predisposition for mental deficiency cannot be excluded.

Although there was deficiency in ascorbic acid levels, in no group were there clinical signs of a deficiency state. Hence it seems likely that deficiencies of ascorbic acid and probably other water soluble vitamins manifest at a biochemical but not at a clinical level in a

substantial proportion of mentally subnormal subjects. However it is reasonable to presume that this biochemical abnormality may manifest clinically during times of infection, convalescence, surgical procedures and other periods of increased requirements and therefore the usefulness of ascorbic acid supplements during such times can hardly be overemphasized.

Summary

An ascorbic acid saturation test was done using dichlorophenolindophenol tablets in 28 mentally retarded subjects from an institutional setting (n = 14) and a community setting (n = 14) and was compared with that in 24 non retarded individuals who formed the control group. There was a significant deficiency in the ascorbic acid status among the study population as compared to the controls but there was no significant difference between the two subgroups from different settings.

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