



RELATIONSHIP OF URINARY HYDROXYPROLINE AND GROWTH IN CHILDREN

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ABSTRACT

Urinary hydroxyproline excretion reflects collagen metabolism which is more in children than in adults due to the growth phase. Present study aims to find relationship between growth and hydroxyproline excretion. Study was done in 90 children of three age groups 6-9 yrs, 10-13 yrs and 14-16 yrs who formed three study groups Group I, Group II and Group III respectively with 30 children in each group. Thirty Adults in age group of 30-40 yrs formed the control group. 24 hrs Urinary Hydroxyproline was estimated in the study and control groups. Student T test was used for statistical analysis. Statistically significant increased excretion of Hydroxyproline ($p < 0.01$) is seen in children in age group of 10-13yrs (Group-II) when compared to control group. Among groups also statistically significant increased excretion is seen in children of 10-13 yrs age group rather than in children of 6-9 yrs and 14-16 yrs age group. In our present study there was more excretion of hydroxy proline in Group II (10-13yrs) where the growth rate is more than in age group 6-9 and 13-16 yrs where the rate of growth is less, results indicate a good correlation between growth and urinary hydroxyproline. Hence it can be used as an effective indicator of growth in children.

KEY WORDS:- Growth in Children , Urinary Hydroxyproline



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INTRODUCTION

Collagen is degraded to free hydroxyproline which is excreted in urine¹. Recent studies indicate that urinary hydroxyproline excretion reflects collagen metabolism as collagen is the only protein in the body that contains hydroxyproline in significant amounts². Increased excretion of hydroxyproline are seen in conditions of increased Collagen metabolism i.e bone disease,^{3,4} growth, ⁵acromegaly, ³hyperthyroidism,^{6,7} primary hyperparathyroidism⁸ and chronic renal diseases⁹. Total Hydroxyproline excretion is related to growth rate and stature of an individual and this excretion is more in children than in adults as more collagen metabolism occurs in children due to growth phase according to several studies.¹⁰⁻¹³ Growth in childhood is very rapid in the first year of life and above age 10 yrs for girls and 12 for boys and relatively slower in the intervening period¹². Growth assessment is a very important physical sign in pediatrics which is done by anthropometry and radiology which are cumbersome and costly. Urinary hydroxyproline estimation can be an economical alternative for growth assessment. In our present study we tried to find the relationship between growth and hydroxyproline excretion. Urinary hydroxyproline is determined in children in the age group of 6-16yrs in children with normal growth.

MATERIALS AND METHODS

Thirty normal healthy volunteers in the age group of 30-40yrs working in Gandhi Medical College participated in the study. Controls are healthy adults who were excluded from collagen related diseases i.e. persons with acute infection, renal disease, arthritis, recent fractures, on steroid medication and other

collagen vascular diseases. Study group comprised of total 90 children who are normal healthy volunteers of 3 age groups 6-9yrs, 10-13 yrs and 14-16yrs who formed three groups group I, group II and group III respectively. Each group has 30 children. In study group also collagen related disorders were excluded. Both controls and study groups were advised to take diet containing less of collagen or gelatin (less meat, fish, jelly, icecream or candy) for 24 hrs prior to urine collection. 24 hours urine was collected in both controls and study groups with toluene as preservative. Urinary hydroxy proline is determined by Neuman and Logan method¹⁴.

RESULTS

In control group mean urinary hydroxyproline excretion was 32.9 ± 2.4 mg/24hrs. Mean daily urinary hydroxyproline excretion in children of age group 6-9 yrs (Study group I) was 34.8 ± 1.8 mg/24hrs. Excretion in children of age group 10-13 yrs (Study group II) was 103.7 ± 2.5 mg/24hrs. And urinary hydroxy proline excretion in children of age group 14-16yr was 40.6 ± 2.2 mg/24hrs. By student t test a comparison was made between control and study groups and intra study group comparisons are also made. There is no significant difference between control and study group I ($P > 0.05$). There is a statistically significant difference in excretion of hydroxy proline in adults (control group) and in children in age group of 10-13yrs i.e. Group II ($P < 0.01$). The excretion of Hydroxy proline is more in children about 10-13 yrs. There is no statistically significant change in excretion of hydroxy proline between control group and study group III. ($p > 0.05$). (Table-1). (Fig-1)

Table-1
Comparison of Urinary Hydroxyproline excretion in control group and three study groups ** p< 0.01

Parameter	Control (n=30)	Study group I (N=30)	Study group II (N=30)	Study group III (N=30)
Urinary Hydroxy proline (mg/24hrs)	32.9±2.4	34.8±1.8	103.7±2.5**	40.6±2.2

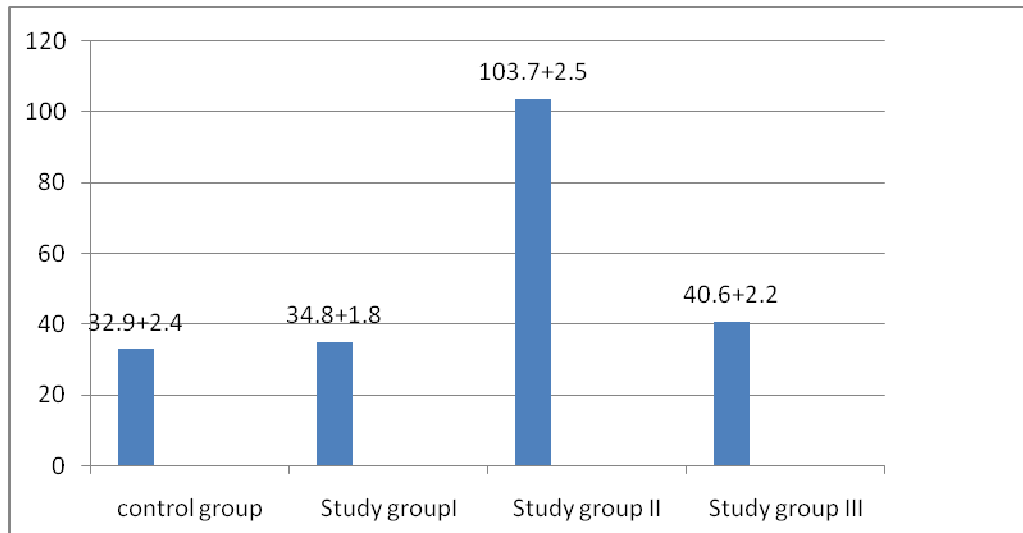


Figure 1
Comparison of mean values between control and Study Groups.

There is statistically significant increase in mean urinary hydroxyproline excretion in Group II when compared to Group I. (P<0.01). There is no statistically significant difference between mean urinary hydroxyproline excretion between Group I and Group III. (p>0.05). There is a significant increase in mean urinary hydroxyproline excretion in Group II than in Group III.(p<0.05). High excretion is seen in children in age group of 10-13yrs rather than in other age groups of 6-9yrs and 14-16yrs.

Table- 2
Comparison of urinary hydroxyl proline among the three study groups ** p<0.01 *p <0.05

Parameter	Study group I (N=30)	Study group II (N=30)	Study group III (N=30)
Age	6-9 yrs	10-13 yrs	14-16 yrs
Urinary Hydroxy proline (mg/24hrs)	34.8±1.8**	103.7±2.5	40.6±2.2*

DISCUSSION

Growth in childhood is more in 1st year of life and between 10-13yrs and is slower in intervening period¹⁵. In our present study there was more excretion of hydroxy proline in Group II than in the age group 6-9 and 13-16 yrs where the rate of growth is less. This shows a positive correlation between growth rate and

excretion of hydroxy proline in urine. There is increased presence of soluble collagen in the tissues of growing animals as a consequence of an increased rate of synthesis of collagen^{15,16,17,18}. The soluble collagen is the precursor of fibrous collagen and has high turnover. Previous studies also indicate that

urinary hydroxyproline is more in young than in adults^{11,12,20}. Our study also agrees with the above studies. The increased excretion during growth is directly related to level of soluble collagen whose turnover is fast whereas fibrous collagen turnover is slow, hence does not contribute much to urinary hydroxy proline.²¹ In adults greater portion is fibrous collagen²² i.e from mature collagen fibres. Hence the urinary hydroxy proline levels are lower than in children. Growth rate is maximum in the age group of 10-13 yrs, so among children also more urinary hydroxy proline is seen in this age

group. During 6-9 yrs and again between 14-16 yrs the growth rate is relatively less. Hence there is no significant difference in excretion of hydroxy proline between these groups and adults.

CONCLUSION

Results indicate a good correlation between growth and urinary hydroxyproline. Hence it can be used as an effective indicator of growth in children.

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