

ABSTRACT

Biochemical Markers of Growth in Children with Trichuris Dysentery Syndrome, Matched Controls and Adolescents

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Study 1. Children with Trichuris dysentery syndrome (TDS) and their matched controls

Impaired growth of undefined aetiology occurs in children with Trichuris dysentery syndrome (TDS). This longitudinal study looks at the relationship between the anthropometric and biochemical markers of growth in a group of 14 children (2-10 years) successfully treated for TDS, during one year of their "catch-up growth". The same markers are described for a group of 28 unaffected matched control children for the same period.

The cases were treated at the Tropical Metabolism Research Unit (TMRU), then followed with the controls as out-patients. Anthropometric and biochemical measurements were done on admission then at three month intervals for one year.

Plasma levels of insulin-like growth factor-1 (IGF-1), type 1 procollagen (PICP) and serum tumour necrosis factor alpha (TNF) were determined by radioimmunoassay (RIA). A complete blood count (CBC), total serum protein (TSP) and serum albumin were also determined.

On admission, the mean Z-scores (NCHS) of the TDS cases in this study were significantly lower than the controls: height (ht) for age, -2.79, 95%CI -5.79, 0.21, $p < 0.001$, weight (wt) for age, -2.75, 95%CI -4.95, -0.55, $p < 0.001$ and wt for ht, -1.53 95%CI -3.33, 0.27, $p < 0.001$. The mean mid-upper arm circumference (MUAC) of the cases was 14.41 cm, 95%CI 11.81, 17.01, $p < 0.001$ and the mean head circumference (HC) was 47.42 cm, 95%CI 43.42, 51.42, $p < 0.001$, also significantly lower.

On admission, the median plasma level of IGF-1, 6.0 nmol/l, range 1.74, 11.64 $p < 0.001$ and PICP, 124.45 ng/ml, range 48.95, 465.50 $p < 0.001$ in the cases, were significantly lower than those of the control children. The plasma levels of IGF-1 and PICP increased significantly one month following treatment. Subsequent measurements showed no

significant difference between the cases and the controls for PICP but IGF-1 was significantly lower in the cases at six and nine months.

Low plasma levels of IGF-1 and PICP were accompanied by high median serum levels of TNF, 119.75 fmol/ml, range 57.9, 225.4, $p=0.005$, TSP, 79.64 g/l, range 64.35, 96.31 $p=0.001$, and low mean haemoglobin (Hb), 8.1 g/dl, 95%CI 2.5, 13.7, $p=0.002$. Circulating TNF and TSP levels remained significantly high on recovery. Serum albumin was normal. There was a significant improvement in the mean Hb of the cases, 10.46 g/dl, 95%CI 8.06, 12.86 after six months.

The observed mean velocities in ht, 8.82 cm/y, 95%CI 4.42, 13.22, $p=0.004$ and HC, 1.15 cm/y, 95%CI -0.43, 2.73, $p=0.008$, of the cases were significantly higher than the controls.

At the end of the year, the mean Z-scores of the cases were : ht for age, -2.16, 95%CI -4.76, 0.44, $p<0.001$, wt for age, -1.86, 95%CI -3.46, -0.26, $p<0.001$, wt for ht, -0.70, 95%CI -2.1, 0.7, NS.

The mean MUAC of the cases was significantly lower than the controls until nine months following treatment. There was no significant difference in mean skinfold thicknesses.

This study indicates that plasma levels of IGF-1 correlate with the Z-scores of ht for age ($r = 0.60, 0.73, 0.68, p < 0.001$) and wt for age ($r = 0.69, 0.79, 0.70, p < 0.01$) of cases, and controls (ht for age, $r = 0.54, 0.43, 0.54, p < 0.01$, wt for age $r = 0.51, 0.52, 0.54, p < 0.01$) at each measurement throughout the year.

No other relationships between any of the biochemical and anthropometric markers of growth nor nutrition were observed.

Study 2. Biochemical markers of growth in adolescents.

A similar series of anthropometric and biochemical measurements was done on a group of adolescents ($n=38$), boys ($n=20$), aged 13.2 to 14.1 years and girls ($n=18$), aged 11.3 to 12.1 years. This study was done to determine if there was any relationship between the anthropometric and biochemical

markers of growth in this group of adolescents and if these findings were similar to those of the children in the 2-10 year age group.

The same anthropometric measurements, plasma determinations of IGF-1 and PICP were done at baseline then at three month intervals for one year. The adolescent girls were slightly above the NCHS reference for their age with the exception of the triceps skinfold. The adolescent boys were slightly below. BMI was associated with % body fat in the girls but not in the boys.

The median baseline plasma levels of IGF-1 in the adolescents were twice those of the younger (2-10 y) control group with the girls, 44.12 nmol/l, range 27.84, 62.12 being significantly higher than the boys, 36.52 nmol/l, range 19.96, 54.26.

The median baseline plasma level of PICP was lower for boys, 328.70 ng/ml, range 174.5, 810.3 than girls 450.75 ng/ml, range 217.19, 698.0. These were similar to the median PICP levels in the recovered TDS cases, 336.9 ng/ml, range 220.9,

552.9 and the controls, 392.25 ng/ml, range 151.0, 624.7 in the 2-10 y age group. The values determined for these age groups are consistent with those of other studies.

There were no consistent relationships demonstrated between the anthropometric and the biochemical markers of growth in this group of adolescents. This may reflect the mixed levels of maturity and the influence of the pubertal hormones in this group.

In conclusion, high levels of TNF and TSP reflect the severity of the inflammatory process in TDS. Circulating IGF-1, PICP & Hb levels are diminished in the inflammatory process. Circulating levels of IGF-1 are associated with the indices of growth and nutrition in the 2-10y age group of Study 1 but not in the adolescent group of Study 2.

These findings may have implications for studies of growth in children affected by other forms of chronic inflammation.