Bone Density Profile in Children Receiving Corticosteroids for Renal Indications for More Than Twelve Weeks

Sowrabha Rajanna[1], Manjunath S Shetty[1], Lakshmi Nagendra [2], Prashanth SN [3], Sajad Ahmed [4]
1 Department of Nephrology, 2 Department of Endocrinology, 3 Department of Pediatrics, 4 Department of Biostatistics,
JSSAHER, Mysuru, Karnataka

WCN25-AB-2795

INTRODUCTION

Corticosteroids form the basis of treatment of many childhood kidney diseases; Steroids can cause osteoporosis in children and have a negative impact on bone mineral content (BMC) and bone mineral density (BMD).This study analyses the relation between steroid exposure and BMD changes in paediatric population as compared to children not on steroids.

METHODOLOGY

This clinical trial was conducted between February-October 2024 and was funded by an academic grant from JSSAHER. 25 children who were on steroids for renal indications and 25 children without history of steroid usage were recruited and underwent BMD DEXA Scan and metabolic work up for bone health.

Children aged 5-18 years and on steroids for more than twelve weeks for renal indications with an eGFR of >90 ml/min/1.73m2 were included in the steroid arm and those without steroid use were included in the control arm.. Children with prior bone disease and those whose parents refused consent were excluded. History including dose and duration of steroid intake, calcium intake (diet and medication) and outdoor activity was noted. Clinical examination with special focus on growth assessment, vital signs, oedema, & ascites . Serum creatinine, serum albumin, serum calcium and phosphorus, alkaline phosphatase levels, serum vitamin D3 levels and intact parathyroid hormone (PTH) were measured in the study population. BMD DEXA scan was performed with GE lunar prodigy advance apparatus and Z scores of Total Body Less Head (TBLH) and Antero-Posterior(AP) Spine noted and compared to reference ranges of USA NHANES data for paediatric population. TBLH value was computed only for children >7years of age for lack of reference data in under seven years population

RESULTS

Twenty-five children on steroids and twenty-five children not on steroids underwent blood analysis and BMD- DEXA scan. In the steroid arm- fourteen were girl children and fifteen were in the prepubertal stage. All children met the daily recommended calcium intake. 18 children were on steroids for nephrotic syndrome, 4 for lupus nephritis and 1 each for Takayasu arteritis, atypical HUS and C3GN. Out of the 25, only 9 children had a height less than 3rd centile. Serum Vitamin D was low (<30 IU) in 14 children. Bone density assessed by AP spine Z score was low in 84% (21 out of 25) children in the steroid arm compared to 12% (3 out of 25) in non-steroid arm . The Z Score of Total Body Less Head was low in 15 of 19 children in the steroid arm compared to 1 of 21 children in the non-steroid arm. The lowest TBLH Z Score was- 2.6

Table 1: Baseline characteristics and study results in children who received steroids versus control group

	Steroid arm(n=25)	Non-steroid arm (n=25)
Age group		
5-9 years	7	6
10-14 years	11	14
15-18 years	6	5
Gender		
Male	9	14
Female	14	11
Height for age		
<3rd centile	9	2
3rd- 95th centile	14	19
>95th centile	2	4
BMI centiles		
<5 Undernourished	0	0
5-85 Normal	17	16
85-95 Overweight	6	8
>95 Obese	2	1
Sexual Maturity Rating (Tanner)		
Stage 1	3	2
Stage 2	8	9
Stage 3	4	5
Stage 4	5	4
Stage 5	5	5
AP spine Z score		
<-1	9	0
-1 to 0	12	1
0 to +1	3	12
>+1	1	12
TBLH Z Score	N-19	N-21
(Children older than 7 years)<-1	4	0
-1 to 0	11	1
0 to +1	3	11
>+1	1	9

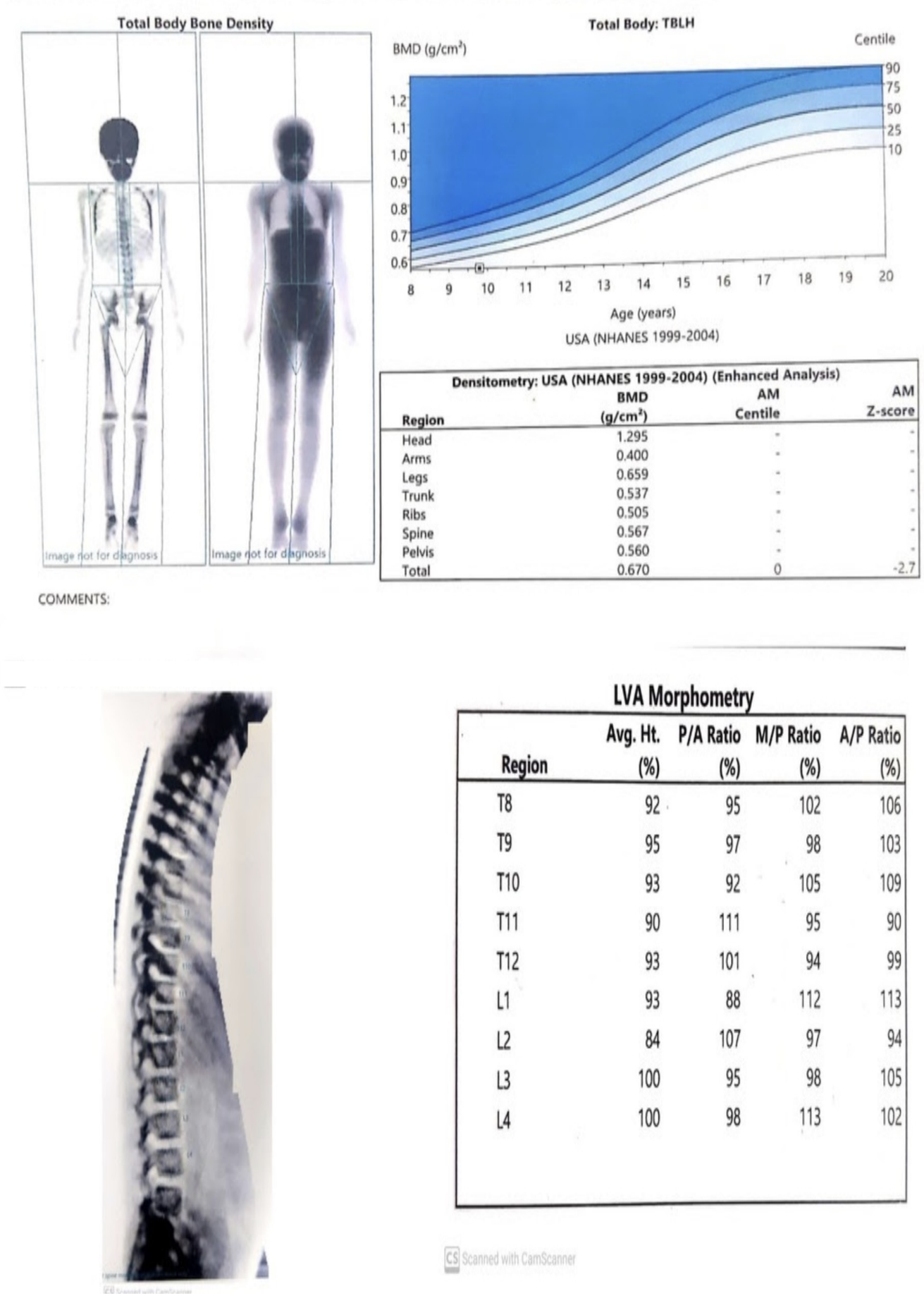

Figure 1: BMD results done in a child who received steroids for aHUS showing <-1SD TBLH and <-1SD AP Spine Z score after 12 weeks of treatment

CONCLUSION

Linear growth retardation is a late marker of steroid toxicity. Paediatric BMD evaluation, when done in indicated cases, aids in early detection of bone changes. This could alert the clinician to adopt a steroid minimizing protocol where possible and address correctable factors such as Vitamin D insufficiency. The challenge of Paediatric BMD is the lack of reference data from the same population. The study suggests the usefulness of inculcating BMD DEXA as a supplementary tool to growth assessment by anthropometry to help minimise long term steroid toxicity on bone growth. The study is limited by the small sample size and paucity of normative BMD data in paediatric population from India. However, BMD study can serve as an ancillary investigation to evaluate early bone changes in children on steroids

- ❑ Linear growth retardation is a late marker of steroid toxicity.
- ❑ Paediatric BMD evaluation, when done in indicated cases, aids in early detection of bone changes.
- ❑ This could lead the clinician to adopt a steroid minimizing protocol where possible and address correctable factors such as Vitamin D insufficiency.
- ❑ The study suggests inculcating BMD DEXA as supplement to growth assessment by anthropometry to help minimise steroid toxicity.