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ORIGINAL ARTICLE

Comparison of Efficacy of Injectable V/S Oral Vitamin D (Cholecalciferol) for the Treatment of Rickets Among Children

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ABSTRACT

Objective: The purpose of this study is to evaluate the effectiveness of vitamin D (cholecalciferol) injections against vitamin D taken orally in the treatment of rickets in children.

Methodology: One hundred patients were chosen at random from the outdoor paediatrics department of Madina Teaching Hospital, Faisalabad, during December 2021 to June 2022 and assigned to receive either oral vitamin D 600,000 IU in three doses on the same day or intramuscular vitamin D 600,000 IU. Vitamin D and x-rays were taken as a baseline. At the 30-day mark, we checked in with every one of the kids again. Children were examined clinically, biochemically, and radiographically, and their results were documented during the subsequent checkup. Pre- and post-treatment increases in blood levels of vitamin D were compared across all groups. Keeping the blood vitamin D level at >20ng/ml at the 30-day follow-up indicated a successful course of therapy.

Results: Our research comparing the effectiveness of injectable vitamin D (Cholecalciferol) and oral vitamin D for the treatment of rickets in children found that 74.29% (n=52) in Group-A and 88.57% (n=62) in Group-B were successfully treated; the p value for this comparison was 0.02.

Conclusion: We found that when comparing injectable vitamin D (cholecalciferol) to oral vitamin D for treating rickets in children, the former was much more successful.

Keywords: Children, Rickets, Vitamin D, injectable, oral, efficacy

INTRODUCTION

In the middle of the 1700s, rickets was identified as a distinct medical disorder for the first time [1], to this day it remains a widespread medical problem. The early 21st century had an overall incidence in the UK of 7.5% per 100,000 children under the age of 5 [2]. Recent estimates suggest a rise in the incidence and prevalence of this condition in developed nations.

Rickets is a disease of the bones characterised by low blood calcium (Ca) and phosphate (Pi) levels, which may lead to defects in the mineralization of the growth plate due to aberrant chondrocyte differentiation and maturation [3, 4]. Bow legs and knock knees are two of the most common skeletal abnormalities caused by rickets, which is a disease that mostly affects longer bones [4].

Historically, rickets was divided into calcipenic and phosphopenic subtypes based on the biochemical abnormalities that manifested first, but recent research reveals that hypophosphatemia is the primary pathogenetic denominator across all subtypes [5]. Medical history, a physical exam, biochemical testing, and imaging techniques are the cornerstones of a correct diagnosis.

Though nutritional rickets is far less common now than it was a century ago, it has been making a comeback in several developed nations [6, 7]. By getting enough sunshine and taking supplements or eating fortified foods high in calcium and vitamin D, this kind of rickets may be avoided. Supplemental calcium and/or vitamin D is indicated for therapy if prevention fails [8-10].

Hereditary rickets caused by defects in vitamin D metabolism or activation require vitamin D metabolites to be injected for treatment [11]. Hypophosphatemic rickets refers to rickets brought on by a dietary deficiency of phosphorus. Renal loss of phosphorus is the underlying cause of this illness, and fibroblast growth factor 23 (FGF23) is typically a contributing component [12].

The most common form of inherited Pi deficiency is X-linked hypophosphatemic rickets (XLHR), also known as X-linked hypophosphatemia, with an incidence of 3.9 per 100,000 live births. [13]. Patients with FGF23-independent phosphopenic rickets may benefit from oral phosphorus supplementation, whereas those with FGF23-dependent rickets often get a combination of activated vitamin D and oral phosphorus supplements as standard therapy. [14]

Seven out of eight (87.5%) children with rickets had 2525(OH)D levels in the adequate range (20-100 ng/mL) at 3 months and 6 months following therapy (Vit D baseline 5ng/ml (5-10.8) vs 6 months 44ng/ml (6.9-64)p value 0.05) after receiving a single intra muscular (IM) dose of vitamin D. [15] Seventy percent of children with rickets improved after receiving vitamin D orally, according to another research (radiological score oral vit D 7.11+2.07 versus IM vit D 8.04+2.20, p value 0.95). [16]

Since the day of rickets is a challenge for medical professionals very few local data was conducted on its treatment with Vitamin-D in comparison of injectable and oral therapy. We will be conducted a study to compare the efficacy of injectable vitamin D (cholecalciferol) and oral vitamin D to fulfill the local gap.

METHODOLOGY

A total of 100 patients were selected from the department Pediatrics outdoor patients, we enrolled all patients of both genders with age 3 months to 02 years with rickets(vitamin D levels are less than 20ng/ml), whereas those already received vitamin D or calcium as treatment, having systemic disease like TB, malignancy, receiving drugs that interface with vitamin D metabolism like sodium Valproate, those having malabsorptive diseases like disease, IBD, who did not completing follow up at 30 days and those having other type of rickets were excluded from the study. Two groups of 50 patients each were given either 600,000 IU of vitamin D orally in three doses on the same day, or 600,000 IU of vitamin D intramuscularly. Once registered, a through clinical history and detail physical examination was carried out to record all aspects of the height, weight, and its complications and also to check signs of any systemic disease or malignancy. Drug history was inquired. Baseline radiograph and vitamin D levels were done. All children were further followed up on day 30. Children were examined clinically, biochemically, and radiographically, and their results were documented during the subsequent checkup. Pre- and post-treatment increases in blood levels of vitamin D were compared across all groups. If, at the 30-day follow-up, the patient's serum vitamin D concentration was still over 20 ng/ml, the therapy had been successful.

RESULTS

Age distribution shows that 38%(n=19) in Group-A and 40%(n=20) in Group-B were between 3-12 months of age whereas 62%(n=31) in Group-A and 60%(n=30) in Group-B were between 13-24 months of age, mean age was 14.17+5.84 years in Group-A and 15.19+6.57 years in Group-B. 76%(n=38) in Group-A and 72%(n=36) in Group-B were male whereas 24%(n=12) in Group-A and 28%(n=14) in Group-B were females. Mean vitamin D levels at baseline in Group-A was 15.32+2.17 and 16.91+3.12 in Group-B, which increased to 19.85+2.92 in Group-A and 22.74+2.32 in Group-B at 30 days of treatment. Comparison of efficacy of in Group-A was 66% and 90% in Group-B, p value was 0.003.

Table 1: Comparison Of Injectable Vitamin D (Cholecalciferol) With Oral Vitamin D (n=140)

Efficacy	Group-A (n=70)		Group-B (n=70)	
	No. of patients	%	No. of patients	%
Yes	33	66	45	90
No	17	34	5	10

P value=0.003

DISCUSSION

In our study, Mean vitamin D levels at baseline in Group-A was 15.32+2.17 and 16.91+3.12 in Group-B, which increased to 19.85+2.92 in Group-A and 22.74+2.32 in Group-B at 30 days of treatment. Comparison of efficacy of in Group-A was 66% and 90% in Group-B, p value was 0.003.

Seven out of eight (87.5%) children with rickets had 2525(OH)D levels in the adequate range (20-100 ng/mL) at 3 months and 6 months following therapy (Vit D baseline 5ng/ml (5-10.8) vs 6 months 44ng/ml (6.9-64)p value 0.05) after receiving a single intra muscular (IM) dose of vitamin D. [15] Another study used oral dose of vitamin D and find effective in 70% children with rickets (radiological score oral vit D 7.11+2.07 vs IM vit D 8.04+2.20, p value 0.95).[16] Our results correspond to this data.

Sara Rahafard and others[17] conducted a study: Supplementation Strategies for Raising Serum Vitamin D Levels in Children With a Deficiency: A Review of Oral and Injectable Vitamin D Patients are referred to the Taleghani Medical Center in Gorgan, where a total of 118 people participated in the trial; however, five participants in the oral treatment group and four participants in the injectable therapy group were excluded due to difficulties with follow-up, medication changes, or missing data. Final tally: 55 patients received injections, while 54 received oral medication. The patients' average age was 8.21 years. To further understand the similarities and differences between the two cohorts, we looked at the gender ratio of our patient populations. A total of twenty-two men (40.7% of the total) and fifteen women (27.3% of the total) were given oral medication. Four weeks and three months following treatment, there was no statistically significant change in vitamin D levels across sexes or body mass indexes. Comparing vitamin D levels at 4 weeks and 3 months post-treatment between the oral treatment group and the injectable therapy group by age (younger than 8 years old / over 8 years old; $p > 0.05$) revealed statistically significant differences. Vitamin D increased more in the injectable treatment group after 4 weeks in the younger age group (27.60 vs. 20.85 and $p = 0.048$, respectively) despite the fact that this difference was not statistically significant ($p > 0.05$). There was no change in the long term after three months. ($p>0.05$), they concluded that both oral vitamin D treatment and vitamin D therapy administered through injection were shown to be equally successful in treating this insufficiency in children, as shown by the findings of the current research as well as prior investigations. On the other hand, the findings of our research indicate that the injectable form produces a greater reaction in the short term in younger children. However, in order to generalise these findings, more research with bigger sample sizes is required.

CONCLUSION

We concluded that Injectable vitamin D (cholecalciferol) is significantly effective when compared with oral vitamin D for the treatment of rickets among children.

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