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ORIGINAL ARTICLE

Serum Vitamin D Level and Biochemical Metabolic Bone Markers and Their Relation to Disease Activity in Juvenile Idiopathic Arthritis

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Abstract

Background: **Juvenile idiopathic arthritis (JIA) is an autoimmune disorder characterized by chronic joint inflammation.**

Aim: **To determine the Serum vitamin D level and biochemical bone markers and their relation to disease activity in JIA.**

Patients and methods: **In a cross-sectional case−control study, 80 children from those attending the outpatient clinic and inpatient of Rheumatology and Pediatric departments, Alazhar University (Assuit) hospital.**

Results: **25-(OH) vitamin significantly lower among those with systemic onset disease. Effusion was frequently found in all examined joints but the knee joint was the most frequently affected joints (75%). Positive power Doppler was detected in 12 (15%), 12 (15%), 10 (8%), and 14 (17.5%) of wrist, elbow, knee, and ankle joints, respectively. Based on radiography findings were perarticular osteopenia followed by a narrowing of joint space while the least finding was bone erosion.**

Conclusion: **Osteoporosis and vitamin D deficiency were a frequent complication of JIA. JIA Patients are likely to have low bone mineral density (BMD). Duration of disease and BMI were more important factors in the development of low BMD in patients with JIA. Vitamin D deficiency and low BMD are an alert to high risk for the development of osteoporosis and vitamin D deficiency later in life in these patients.**

Keywords: Bone mineral density, Juvenile idiopathic arthritis, Vitamin D

1. Introduction

Juvenile idiopathic arthritis (JIA) is described by the beginning of joint inflammation preceding the age of 16 years; one of the commonest rheumatic infections of kids and a significant reason for short- and long haul handicap. In spite of the fact that multi-factorial provocative illness portrayed by tireless joint irritation which appears as expanding, torment and constraint of movement.[1]

Hypovitaminosis D is a significant general medical condition and influences kids from one side of the planet to the other. A few examinations have likewise revealed high rates of lack of vitamin D and deficiency during childhood.[2]

Notwithstanding the job of vitamin D in bone mineralization and calcium digestion; it affects inborn and versatile insusceptibility. It is conjectured that irregularities in vitamin D digestion cause the arrival of proinflammatory cytokines hindering administrative White blood cell production.[3]

The way that vitamin D inactivates Th1 and Th17, the two of which are remembered to play a part in JIA pathophysiology, upholds the case that there might be a connection between lack of vitamin D and JIA. Be that as it may, information in regards to

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the relationship between illness action and serum vitamin D levels in kids with JIA are limited.[4]

US can distinguish fiery and damaging changes in JIA. US is a fast, reasonable and bedside strategy for assessing youngsters with no requirement for anaesthesiological support. US has demonstrated before appraisal of synovial, ligament and bone irregularities than ordinary radiology. US has shown higher responsiveness for recognizing synovitis contrasted and clinical assessment. Repeatability and the chance of looking at a few joint locales at one meeting are of fundamental significance for observing joint harm in JIA. US can likewise be utilized to survey tenosynovitis and to direct joint goal or infusion. What's more, the utilization of Doppler methods works with recognition of synovial vascularization in distinguishing dynamic disease.[5]

Therefore; this study aims to determine the Serum vitamin D level and biochemical bone markers and their relation to disease activity in JIA.

2. Patients and methods

In a cross-sectional case–control study that included 40 children from those attending the outpatient clinic and inpatient of Rheumatology and Pediatric Departments, Alazhar University (Assuit) hospital and 40 healthy children. They were divided into two groups matched in age and sex (40 cases per group): group (1): forty children suffering from JIA with age ranges from 1 to 16 years. ILAR criteria were used for the classification of JIA. Group (2): 40 healthy children with matched age and sex as a control group age ranges from 1 to 16 years.

Children aged 1–16 years, any type of JIA, and new and old cases were included. Children less than 1 year or greater than 16 years with other chronic diseases, receiving stable doses of anti-TNF agents and calcium and vitamin D supplements for 3 months, with a history of recent infections, and obese children were excluded.

The accompanying examination was performed for all patients and controls: individual history, history of current ailments, history of constant illnesses, meds, surgeries, sensitivities, blood bondings, and family ancestry.

The JADAS-27 sickness action score was evaluated utilizing a formerly approved score, the JADAS-27. JADAS-27 incorporates the accompanying joints: cervical spine, elbows, wrists, metacarpophalangeal joints (first through third), proximal interphalangeal joints, hips, knees, and lower legs. The score for every dynamic connection is 1 point; the absolute score goes from 0 to 27. The JADAS is determined as a straightforward direct amount of the four part scores, bringing about an all out score going from 0 to 57, with higher scores showing more prominent illness action. Complete blood count, erythrocyte sedimentation rate (ESR), C reactive protein (CRP), blood urea nitrogen and serum creatinine, liver compounds, rheumatoid component, complete urinalysis, antinuclear antibodies, serum calcium, phosphorus, basic phosphatase (High mountain), parathyroid chemical (PTH), and pee deoxypyridinoline. Serum vitamin D levels (25 (OH) D) were characterized as serum 25 (OH) D levels under 15 ng/ml, vitamin D lack as 25 (OH) D levels somewhere in the range of 15 and 20 ng/ml, and serious vitamin D level inadequacy. D lack with 25 (OH) D levels under 5 ng/ml. Vitamin D qualities over 20 ng/ml were thought of as adequate. The radiographs utilized in plain radiographs were kept on two hands in the posero-foremost view, on the two wrists (A-P), on the two elbows (A-P) and sideways, on the two knees (A-P) while standing, and on the two lower legs (A-P) also, sideways. See.

Ultrasound assessments were performed: MSUS (Toshiba Synovial Thickness) gadget.

The mineral thickness of the wrist bones was resolved utilizing double energy X-beam absorptiometry (DEXA). Values were changed over completely to z-scores by correlation with age-and orientation explicit reference values for this gadget. Verbal and composed assent will be acquired from those wishing to take part in the review. The classification of the information was ensured.

Data were collected and analyzed using SPSS. The confidence level was maintained at 95% and therefore the *P* value was considered significant if it was less than 0.05.

3. Results

Both studies groups had insignificant differences as regard age and BMI Majority of studied groups was females with insignificant difference between both groups (Table 1). Those patients with JIA had significantly higher CRP, ESR, and PTH. JIA group

Table 1. Baseline data of enrolled groups.

	Study group ($n = 40$) [n (%)]	Control group ($n = 40$) [n (%)]	*P* value
Age (years)	9.25 ± 3.70	9.73 ± 3.32	0.54
BMI (kg/m^2)	23.13 ± 1.73	22.45 ± 1.22	0.07
Sex			0.06
Male	8 (20)	15 (37.5)	
Female	32 (80)	25 (62.5)	
Positive family history	4 (10)	4 (10)	0.64
Positive consanguinity	5 (12.5)	4 (10)	0.50

had significantly lower 25-(OH) vitamin D ($P < 0.001$) and bone mineral density (BMD) ($P < 0.001$) and Z score ($P < 0.001$)) with higher ALP ($P < 0.001$) (Table 2). It was found that different types of the disease based on its onset had significant differences as regard 25-(OH) vitamin that was significantly lower among those with systemic onset disease (Table 3). Insignificant differences as regards BMD and Z score but it was noticed systemic onset disease had the least BMD and least Z score (Table 4). Effusion was frequently found in all examined joints but the knee joint was the most frequently affected joints (75%). Synovial hyperplasia was frequently found in ankle (75%) and wrist (62.5%) joints. Positive power Doppler was detected in 12 (15%), 12 (15%), 10 (8%) and 14 (17.5%) of wrist, elbow, knee, and ankle joints, respectively. Based on radiography findings were per-articular osteopenia followed by a narrowing of joint space while the least finding was bone erosion (Table 5).

4. Discussion

Connections between vitamin D and persistent youth joint inflammation are obtained from studies having different methodologic approaches, starting from various geographic locales, and including demographically unique populaces. Past examinations showed that vitamin D plays a significant part in keeping up with both the skeletal and resistant systems.[6]

Table 3. 25-(OH) vitamin and urinary deoxypyridinoline based onset of the disease.

	25-(OH) vitamin (ng/mL)	Urinary deoxypyridinoline (nmol/l)
JIA onset type		
Oligoarthritis	20.98 ± 3.81	19.19 ± 4.91
Systemic-onset	11.87 ± 2.22	28.98 ± 3.09
Seropositive-polyarthritis	18.98 ± 3.71	18.18 ± 3.51
Seronegative-polyarthritis	19.11 ± 4.56	17.99 ± 6.76
P value	**0.02**	**<0.001**

Table 4. Bone mineral density based onset of the disease.

	BMD (gm) at L1-L4	Z score
JIA onset type		
Oligoarthritis	42.34 ± 3.45	20.43 ± 2.22
Systemic-onset	38.98 ± 2.01	18.99 ± 3.23
Seropositive-polyarthritis	40.11 ± 3.56	19.11 ± 2.19
Seronegative-polyarthritis	40.98 ± 4.44	19.44 ± 3.09
P value	0.06	0.22

Here, the review is meant to decide the serum vitamin D level and biochemical bone markers and their connection to sickness movement in JIA.

We found that the two social occasions had immaterial differences as regards benchmark data. Similarly, a larger part (80%) of patients was

Table 2. Baseline laboratory data and bone mineral density of enrolled groups.

	Study group ($n = 40$) [n (%)]	Control group ($n = 40$) [n (%)]	*P* value
Hemoglobin (g/dl)	10.61 ± 2.34	11.34 ± 1.11	**0.03**
Platelets (10^3/ul)	164.56 ± 15.67	170.11 ± 25.67	0.12
Leucocytes (10^3/ul)	5.26 ± 2.08	6.45 ± 2.19	0.39
Aspartate transaminase (u/l)	33.96 ± 19.35	34.67 ± 13.45	0.37
Alanine transaminase (u/l)	28.13 ± 8.89	31.13 ± 5.09	0.09
Bilirubin (mmol/l)	17.64 ± 2.34	16.67 ± 3.33	0.39
INR	1.01 ± 0.03	1.01 ± 0.01	0.19
Albumin (mg/dl)	36.18 ± 2.43	37.78 ± 3.33	0.18
Urea (mg/dl)	9.32 ± 2.22	10.11 ± 2.51	0.54
Creatinine (mmol/l)	92.83 ± 14.45	100.98 ± 12.12	0.98
CRP (mg/dl)	28.11 ± 2.22	3.11 ± 1.09	**<0.001**
ESR (ml/h)	78.98 ± 22.76	11.09 ± 1.23	**<0.001**
Calcium (mg)	7.01 ± 2.11	8.90 ± 2.20	**0.01**
Alkaline phosphatase (IU/l)	156.87 ± 45.67	98.09 ± 12.21	**<0.001**
Phosphorus (mg/dl)	4.35 ± 0.84	4.48 ± 1.25	0.22
Parathermone (pg/ml)	58.11 ± 12.34	25.67 ± 4.44	**<0.001**
25-(OH) vitamin D (ng/mL)	16.78 ± 2.98	22.87 ± 5.45	**<0.001**
Urinary deoxypyridinoline (nmol/l)	20.20 ± 5.67	4.42 ± 1.57	**<0.001**
Positive rheumatoid factor	28 (70)	0	
Positive ANA	8 (20)	0	
BMD (gm) at L1-L4	41.15 ± 4.90	47.80 ± 1.58	**<0.001**
Z score	0.19 ± 1.60	0.84 ± 1.39	**<0.001**

Table 5. Ultrasound and radiography findings among the study group.

Ultrasound findings	Examined joints			
	Wrist ($n = 80$) [n (%)]	Elbow ($n = 80$) [n (%)]	Knee ($n = 80$) [n (%)]	Ankle ($n = 80$)
Effusion	45 (56.3)	50 (62.5)	60 (75)	50 (62.5)
Synovial hyperplasia	50 (62.5)	32 (40)	45 (56.3)	60 (75)
Power Doppler	12 (15)	12 (15)	10 (8)	14 (17.5)
Synovitis	24 (30)	8 (10)	32 (40)	23 (28.8)
Radiography findings				
Per-articular osteopenia	50 (62.5)	40 (50)	32 (40)	30 (37.5)
Narrowing of joint space	14 (17.5)	14 (17.5)	15 (18.8)	14 (17.5)
Bone erosion	12 (15)	11 (13.8)	8 (10)	7 (8.7)

females. As per the continuous audit, Oommen *et al.*[7] focused on 152 patients with JIA and 188 strong patients as control pack. The makers communicated no immense differentiation between the two get-togethers as regard fragment data.

Our examination found that four (10%) and five (12.5%) patients had the positive family foundation of JIA and a positive history of relationships. This was unsurprising with the examination of El-Gharbawy *et al.*[8] which showed a positive association in 13.75% of patients and 22.5% of patients had positive family foundation of JIA.

In a past examination of 152 patients with JIA Stagi *et al.*,[9] the mean range of the disease was month 129.5 ± 11.1 months. As for JIA starting, 96 patients were oligoarticular type, 35 polyarticular, seven essential, and 14 enthesitis-related joint irritation.

As regard show, the most progressive presentations were fever (92.5%), joint agony (87.5%), and rash (85%). It was seen that lymphadenopathy, hepatomegaly, splenomegaly, and pericarditis were considered in 24 (60%), four (10%), three (7.5%), and two (5%) patients, independently. The most affected joints in the focused on patients were wrist (77.5%), knee (75%), and lower leg (half).

Hussein *et al.*,[10] communicated that knee joints were predominately related with oligoarticular JIA while wrist, elbow, sacroiliac joints, and little joints of the hand showed higher gigantic differentiation to poly articular subtype. Like the results reported by Viswanathakumar and Kumar.[11]

In the continuous audit, the mean JADAS-27 was 12.38 ± 8.15 with a range between 1 and 34. A previous report communicated that JADAS-27 was headed off to some place in the scope of 0 and 40 Bulatović Ćalasan et al.[12]

We saw that 28 (70%) and eight (20%) patients had the positive rheumatoid part and against nuclear neutralizer, independently, patients with JIA had generally lower hemoglobin and calcium. Alternately, those patients had higher CRP, ESR, and PTH. Moreover, these disclosures were close to delayed consequences of Abdwani *et al.*[13] and Cutolo *et al.*[14] (18.4% and 19.9%).

In the continuous survey, we found that patients with JIA had lower 25-(Goodness) vitamin D ($P < 0.001$) conversely, with the benchmark bunch. Moreover, a previous report Stagi *et al.*,[9] communicated that patients with JIA showed generally lessened 25 (OH) D levels diverged from controls ($P < 0.001$).

In the continuous audit, we found that the patients bundle had in a general sense lower BDM ($P < 0.001$) and Z score ($P < 0.001$) conversely, with the benchmark bunch. Moreover, we found that higher urinary deoxypyridinoline interestingly, with the benchmark bunch ($P < 0.001$).

BMD may be seen as a substitute marker of blazing joint sickness and could reflect Vitamin D levels. Anyway, BMD was represented in a complex, nonstandardized way with a huge assortment between measures paying little heed to being the point of convergence of a couple of assessments Lien et al.[15] One paper exploring the limit of vit D levels to predict BMD assumed that no relationship could be spread out when patients were seeking long-stretch corticosteroid treatment Reeve et al.[16]

Likewise, past audits focused on the all-around ultrasonographic disclosures of various joints. In the US, irrelevant joint radiation was the most broadly perceived finding in 328 cases (most ordinary in the knee), while synovial hyperplasia was accessible in 292 (most typical in the lower leg) joints Dev et al.[17]

In the continuous survey, considering x-bar disclosures, the most progressive revelations were per-articular osteopenia followed by confining of joint space while the most un-finding was bone crumbling. Differentiated and standard radiography, the capacity to assess capably and logically the joints in a couple of planes makes MSUS a more supportive gadget for perceiving deteriorations Magni-Manzoni.[18]

4.1. Conclusion

Osteoporosis and the absence of vitamin D were standard unpredictability of JIA. JIA Patients are most likely going to have low BMD. Length of disorder and BMI were huge factors in the improvement of low BMD in patients with JIA. Absence of vitamin D and low BMD a wariness to high take a risk to improve osteoporosis and absence of vitamin D at some point in these patients.

Ethics

Its was approved by faculty.

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Conflicts of interest

There are no conflicts of interest.

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