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Original Paper

Risk Factors of Vitamin D Deficiency Associated with Dental Caries among School-Aged Children of District Peshawar

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***Abstract*— Vitamin D deficiency and dental cavities are global issues. Thus, the purpose of the study is to investigate how dental caries in school-age children from the Peshawar district is affected by vitamin D insufficiency. The study included 1600 kids ranging in age from 4 to 15 years old. To obtain samples, a methodical random sampling procedure was used. In the current study, 1600 samples were calculated to investigate vitamin D deficiency in children enrolled in school. Men were found to have a significant percentage of vitamin D insufficiency (22.5%), but female had a relatively low ratio (12.5%). Male students made up 220 (27.5%) of the school-age population, while female students made up 100 (12.5%). Both genders had significant rates of insufficiency. Age-appropriate investigation. Male students made up 220 (27.5%) of the school-age population, while female students made up 100 (12.5%). Both genders had significant rates of inadequacy. The investigation of vitamin D deficiency according to age reveals that very low frequency was found in the low aged group (4–7 years) 80 (10%), similarly low frequency was found in the 8–11 years group 120 (15%), and very high frequency was found in the 12–15 years group 160 (20%). According to the data broken down by residency, children living in urban areas had a high frequency ratio of 160(20%) compared to 120(15%) for children living in rural areas. Long-term health effects are associated with the growing issue of vitamin D insufficiency and its relationship to school-age children's intellectual performance. The current investigation demonstrated the connection between investigation of vitamin D deficiency according to age, gender, and socioeconomic position.**

Keywords—component, formatting, style, styling, insert (*key words****)***

I. INTRODUCTION

Lack of vitamin D is a significant global health issue that affects both industrialized and developing nations, with a 30-80% prevalence in adults and children globally. It is well known that vitamin D plays a part in the mineralization of bones [1].The importance of vitamin D [25(OH) D] in maintaining a healthy bone structure as well as in the metabolism of calcium and phosphate has begun to spread throughout the world. Numerous studies demonstrate that children globally suffer from shortage and insufficiency in 25(OH) D [2]. Reduced bone mineral density results from poor calcium and phosphorus absorption when there is a 25(OH) D deficit or insufficiency[3].

A person's current and future health state are impacted by low 25(OH) D levels, which can cause a variety of systemic reactions. Decreasing bone density and immune response because 25(OH) D receptors are present in many different tissues. They are linked to growth retardation, skeletal abnormalities, and secondary hyperthyroidism in children, while hip fractures in the elderly are seen in people with compromised bone structure[4]. Furthermore, a growing body of research is elucidating the connection between low 25(OH) D levels and several non-skeletal disorders, such as autoimmune, infectious, cardiovascular, mental, and some cancers [5]. The following were identified as risk factors for 25(OH)D deficiency in children: low levels of sun exposure, clothing habits, climatization and seasonality, dark skin color, intestinal malabsorbtion syndromes, use of anticonvulsant medications such as phenytoin, phenobarbital, and carbamazepine, and obesity[6]. The serum 25 (OH) D levels of an individual are examined to ascertain their vitamin D status. Various organizations and guidelines suggest using different threshold points to evaluate an individual's 25 (OH) D status[7]. In order to produce healthy generations with strong bone structure, routine assessment of 25(OH) D levels in children and replacement of low levels with vitamin D fortification or supplementation is crucial and a public health concern. The aims of the study to explore gender and aged wise deficiency of vitamin D and Dental caries among school aged children of the local area of district Peshawar

II. MATERIALS AND METHODS

The purpose of this study was to investigate dental caries and vitamin D deficiency in school-aged children in the District Peshawar. We analyzed the records of 1600 children who were born between June 4–15, 2023, and December 20, 2023. All patients underwent a thorough physical examination. Body mass index (BMI) was calculated using the formula [weight (kg)/height (m)2]. Patients with a history of a chronic disorder or who were taking any medication that may affect vitamin D metabolism were excluded from the study. Serum calcium (Ca), phosphorus (P), magnesium (Mg), alkaline phosphatase (ALP),and glucose levels were measured, measured using the enzymatic colorimetric method (Roche Integra 800), while serum 25 hydroxy vitamin D. 25(OH) D] levels were measured by highperformance liquid chromatography (Shimadzu UFLC). According to WHO formula :

$$BMI = \frac{Weight}{Hight(M^2)} \quad \text{.....(1)}$$

S.No	Status	Student BMI	Normal BMI	HB Level
1	Anemia	20bmi	18.5-24.9	>12,>14g/Dl
2	Underweight	18bmi	18.5-24.9	<12,14g/Dl
3	Malnutrition	17.3bmi	18.5-24.9	<12,14g/Dl
4	Stunting	11.2bmi	18.5-24.9	<12,14g/Dl
5	Wasting	9.5bmi	18.5-24.9	<12,14g/Dl

A. Study Area and Period

The study was conducted in the local area District Peshawar, which is located Khyber Pakhtunkhwa.

B. Study Design

Institutional based cross-sectional study designs were used.

C. Study Population

All secondary and primary school students age group wise the source population, whereas sampled or selected students were the study population of this study.

D. Sample Size Determination

A Total of 1600 children between the ages of 4-15 years were studied. A systematic random sampling technique was applied for sample collection.

E. Lab investigations and Tests: All patients were subjected to:

Complete Blood count and reticulocyte count. Patients with microcytosis underwent the following:

1) Serum Iron and ferritin

An automatic hematological analyzer and Biochemistry analyzer were used for clinical examination

F. Routine Blood Tests

This is done to assess anemia and other vitamin and mineral deficiencies. There may be dehydration, low blood sugar and signs of severe infection as is evident by raised while blood cell counts.

G. Diagnosis of Malnutrition in Children

In children weight and height is measured and compared with the charts showing the expected average height and weight for a child of that age. Some children are persistently smaller for age and may be genetically so.

H. Blood Tests in Children

Routine blood tests in children include those for blood glucose, blood counts, urine for routine examination. Levels of iron in blood, folic acid and vitamin B 12 are also done. For protein estimation other tests including. Normal ranges of ferritin 10 to 150 ng/mL for children 4th years to14 years. MCV normal range is 80 to 95 for children

III. ANALYSIS & INTERPRETATION

A. Analysis and Interpretation of data

Data will analyze and interpret by using M word, Origin8 and Excel. Frequency and Percentage were calculated for all quantitative variables.

B. Ethical Consideration

The subjects were briefed about the study. Consent was taken from the subjects after explaining the purpose of study for the collection of data.

Questionnaire form

Demographics information:	General information	Dietary Habits
Child's Name:	Do you have breakfast every day	What is your favorite healthy
	before going to school? (Yes/No)	food?
Age : Gender :	How many meals do you typically	How often do you drink water in a
Grade/Class:	eat in a day?	day?
School Name:	Do you eat fruits and vegetables	Less than 3 glasses
Family background:	daily? (Yes/No)	3-5 glasses
How many people live in the	How often do you consume fast	6-8 glasses
child's household.?	food? (Yes/No)	More than 8 glasses
Male and female ratio in child's	Anthropometric Measurements	Are you aware of the importance
household.?	Height (cm):	of a balanced diet? (Yes/No)
Family income status?	Weight (kg):	Do you receive any nutrition
Hereditary diseases in family?	BMI (Body Mass Index):	education at school? (Yes/No)

S.no	Serum 25(OH)D	Status
1	Serum 25(OH)D	Deficient < 50nmol/L
		Insufficient 50-75nmol/L
		Sufficient <75nmol/L
2	Mean Serum 25(OH)D	55+ 6nmol/L

C. Statistical Analysis

Statistical analysis was performed by using Origin8 and MS office word 2010.

IV. Results And Discuss

The total 1600 samples were calculated for the current study to investigate vitamin D deficiency in school-aged children. 800 of the 1600 samples came from male students, and the remaining 800 came from female students. Males accounted for 180 percent of those with vitamin D deficiency (22.5%), whereas females made up just 100 (12.5%). Figure 1. In addition, male students had higher ratios of inadequacy in school-age children (220, or 27.5%) than female students100 (12.5%), and dental caries was more common in 100(6.25%), of students.

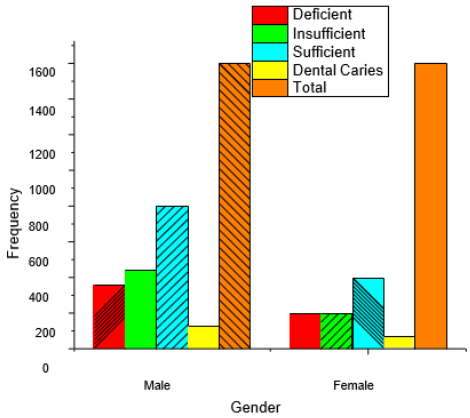

Fig. 1. Gender wise prevalence of Dental caries and Vitamin D deficiency in School Children

Age-wise investigation of vitamin D deficiency reveals that there was a very low frequency of 80(10%) in the low aged group (4–7), a similarly low frequency of 120(15%) in the 8–11 age group, and a very high frequency of 160(20%) in the 12–15 age group (Figure 2).

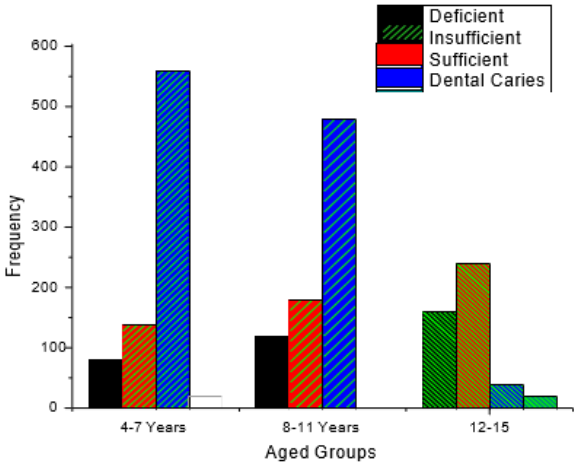

Fig. 2. Gender wise prevalence of Dental caries and Vitamin D deficiency in School Children

Residency wise results shows that the frequency ration of urban children were high 160(20%) as compare to rural area children 120(15%) respectively figure.3

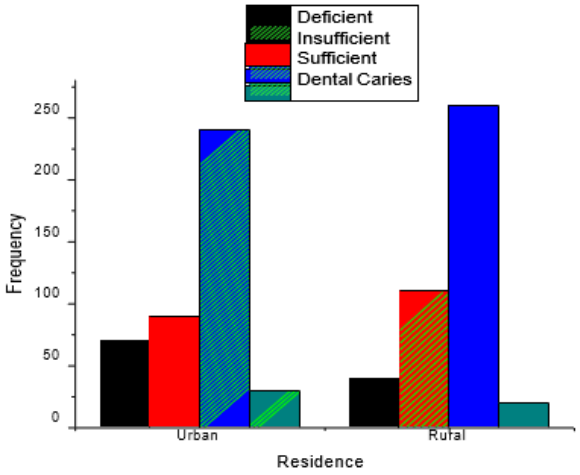

Fig. 3. Residence wise Vitamin D deficiency in School Children

Our study also reveal that the vitamin D deficiency related with that of socioeconomic status which shows that the high frequency were found in children of high socioeconomic status as compare to that of the children of low socioeconomic status. In conclusion the vitamin D deficiency was found to be dependent on sunlight, diet and the other factors are socioeconomic status, residency of schoolchildren. The results explore that the need for behavior change communiqué on the significance of exposure to sunlight to create appropriate vitamin D in the schoolchildren of the local area of Peshawar. This emerging health problem of Vitamin D deficiency and its connection with the academic carrier of school going children long term health consequences. As the present study only highlighted the association between vitamin D deficiency in different aged group, gender and socioeconomic status wise exploration of vitamin D deficiency.

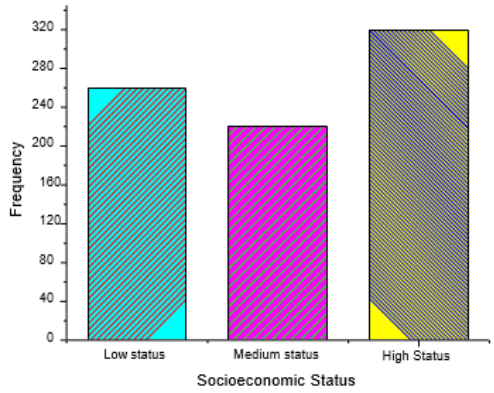

Fig. 4. Socioeconomic Status

V. Discussion

In the current research work 1600 samples were estimated for the exploration of Dental caries and vitamin D deficiency among school aged children. Out of 1600 samples 800 from male students while 800 were taken from the females' student. The high percentage of Vitamin D deficiency were found in male 180(22.5%) while very low ration were found in female 100(12.5%). while the ratios of insufficiency in the school aged children were also high in male 220(27.5%) children as compare to female 100(12.5%) students were respectively. Same study were also conducted by [9,10] a total of 6,008 children aged 1 month to 16 years partaken in this cross-sectional study. All of the participants were separated into age-based subgroups: 0–1 years, 2–5 years, 6–11 years, and 12–16 years, which corresponded to the infancy, preschool, school age, and adolescent periods, respectively. The 0–1 year stage had the greatest mean level of serum 25(OH)D (99 nmol/L), whereas the 12–16 year stage had the lowest mean level (52 nmol/L). As a result, serum 25(OH)D levels of less than 75 nmol/L and less than 50 nmol/L were most common in teenagers (89.6% and 46.4%, respectively) and least common in babies (33.6% and 5.4%, respectively). Seasonal variations were seen in the mean serum 25(OH)D levels and the frequency of vitamin D insufficiency. Over 50% of children and adolescents of school age had a 25(OH)D level of less than 50 nmol/L in the winter and spring. If the cutoff

to < 75 nmol/L, all of the adolescents (100%) had low 25(OH)D levels in winter and 93.7% school age children as well. Aged wise exploration of vitamin D deficiency shows that very low frequency were showed in low aged group 4-7 years 80 (10%), similarly in 8-11 years the frequency of vitamin D deficiency were 120(15%) while in aged group 12-15 years the frequency of Vitamin D deficiency were found very high 160(20%).smilerly a research work also performed by[12] Serum 25(OH)D levels ranged from 3.90 to 64.60 ng/mL, the median value was 25.95 ng/mL for all subjects. Of all the primary school children, 485 (75.78%) had adequate levels of 25(OH)D. Vitamin D deficiency was observed in 36 of children (5.62%), whereas insufficient levels of 25(OH)D were found in 119 children (18.60%). The ratio of vitamin D insufficiency and deficiency together was highest in spring (31.87%) and lowest in summer (13.12%).

Residency wise results shows that the frequency ration of urban children were high 160(20%) as compare to rural area children 120(15%) respectively. Residency wise study also conducted by[13] a sample of 2386 schoolchildren (9–13 years old) from four distinct prefectures was examined. The prevalence of 25-hydroxyvitamin D (25(OH) D) concentration <30 and <50 nmol/l (vitamin D deficiency and insufficiency respectively) was 5·2 and 52·5 %, respectively. Girls had a higher prevalence of 25(OH) D <30 (7·2 v. 3·2 %) and 50 nmol/l (57·0 v. 48·0 %) than boys (P<0·001). The highest prevalence rates of 25(OH) D <30 and 50 nmol/l (9·1 and 73·1 %, respectively) were observed during spring (April to June), whereas the lowest (1·5 and 31·9 %, respectively) during autumn (October to December). The prevalence of 25(OH) D <50 nmol/l was higher in urban/semi-urban than rural regions, particularly during spring months (74·6 v. 47·2 %; P<0·001). Female sex, urban/semi-urban region of residence and spring months were found to increase the likelihood of vitamin D deficiency and insufficiency, with the

highest OR observed for spring months (7·47; 95 % CI 3·23, 17·3 and 5·14; 95 % CI 3·84, 6·89 for 25(OH)D <30 and 50 nmol/l respectively).

In the current research work the prevalence of Dental caries was 100(6.25%) in vitamin D deficient students in the local area of district Peshawar. A study was also conducted by [15] The dental index of decayed, missing and filled teeth (DMFT) in the deficient and insufficient vitamin D groups was significantly higher than in the sufficient vitamin D group (P=0.03). The linear regression model on the effect of age, vitamin D, and calcium on dental indexes showed no significant statistical relationship. However, in the case of the dental index, age, and calcium level affected dental caries (d), but vitamin D did not affect this index.

CONCLUSION

The findings investigate the necessity of a behavior modification communication regarding the importance of sun exposure for the production of enough vitamin D in Peshawar School kids. The relationship between school-age children's academic performance and long-term health implications of vitamin D deficiency and dental caries is a growing health concern. Since the current study only examined the relationship between vitamin D deficiency and various age groups, gender, and socioeconomic position, it did not explore vitamin D deficiency in detail.

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