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A study to assess the prevalence of Vitamin D deficiency among school-aged children at selected school, Rohtas, Bihar.

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ABSTRACT

Background:

Vitamin D is an essential fat-soluble vitamin that plays a vital role in calcium absorption, bone mineralization, skeletal growth, and immune function. Despite abundant sunlight in India, Vitamin D deficiency has become a major public health problem among school-aged children due to inadequate sunlight exposure, poor dietary habits, reduced outdoor activities, and changing lifestyle patterns. Deficiency of Vitamin D during childhood may lead to impaired bone growth, rickets, muscle weakness, frequent infections, and poor overall health. Early identification of Vitamin D deficiency is therefore important to promote healthy growth and prevent long-term complications among children.

Aim:

The present study aimed to assess the prevalence of Vitamin D deficiency among

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school-aged children at selected school, Rohtas, Bihar.

Methods:

A quantitative research approach with a descriptive cross-sectional research design was adopted for the study. A total of 60 school-aged children (6–12 years) were selected using a convenient sampling technique. Data were collected using a structured questionnaire consisting of socio-demographic variables, Vitamin D-related factors, and a checklist of clinical indicators of Vitamin D deficiency. The collected data were analyzed using descriptive statistics such as frequency and percentage, and inferential statistics were used to determine the association between the prevalence of Vitamin D deficiency and selected demographic variables.

Results:

The findings revealed that **46.7% (28)** of the school-aged children had Vitamin D deficiency, whereas **53.3% (32)** were not deficient. A significant association was found between the prevalence of Vitamin D deficiency and selected demographic variables such as type of diet, sunlight exposure, and physical activity ($\mathbf{p < 0.05}$). No significant association was observed with age, gender, father's education, and mother's education.

Conclusion:

The study concluded that Vitamin D deficiency is prevalent among school-aged children at the selected school in Rohtas, Bihar. Poor dietary intake, inadequate sunlight exposure, reduced outdoor activities, and sedentary lifestyle were identified as important contributing factors. The findings emphasize the need for regular screening, health education, nutritional improvement, and promotion of adequate sunlight exposure to prevent Vitamin D deficiency and promote healthy growth among school-aged children.

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Keywords:

Vitamin D deficiency, School-aged children, Prevalence, Sunlight exposure, Dietary habits, Nutritional status, School health, Bihar.

INTRODUCTION

Vitamin D deficiency is one of the most common micronutrient deficiencies worldwide and has emerged as a major public health concern, particularly among children. Vitamin D is an essential fat-soluble vitamin that plays a vital role in calcium and phosphorus metabolism, bone mineralization, skeletal growth, and maintenance of overall health. In addition to its role in bone health, Vitamin D also contributes to immune function, muscle strength, neuromuscular activity, and prevention of various chronic diseases. Deficiency of Vitamin D during childhood may lead to rickets, impaired growth, skeletal deformities, muscle weakness, recurrent infections, and poor physical development. Therefore, early identification of Vitamin D deficiency is essential to promote healthy growth and prevent long-term complications among school-aged children.

In recent years, the prevalence of Vitamin D deficiency has increased considerably despite abundant sunlight, especially in developing countries such as India. Factors such as inadequate sunlight exposure, poor dietary intake of Vitamin D-rich foods, reduced outdoor physical activity, excessive screen time, urbanization, environmental pollution, and lack of awareness among parents have contributed to this growing problem. School-aged children are particularly vulnerable because of their rapid growth and increased nutritional requirements. Several studies conducted in India have reported a high prevalence of Vitamin D deficiency among children, highlighting the need for regular assessment, nutritional education, and preventive interventions.

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The prevention and control of Vitamin D deficiency require a comprehensive approach that includes adequate sunlight exposure, balanced nutrition, increased physical activity, health education, and early screening. Schools provide an ideal setting for assessing the nutritional status of children and implementing health promotion programs. School health nurses play a crucial role in identifying children at risk, educating parents and teachers, promoting healthy lifestyle practices, and facilitating early referral whenever necessary. Early detection of Vitamin D deficiency can help prevent future complications and improve the overall health and well-being of children.

Considering the increasing burden of Vitamin D deficiency among school-aged children and the limited availability of local data from rural Bihar, the investigator felt the need to assess the prevalence of Vitamin D deficiency among school-aged children studying at Rajkiya Aadarsh Madhya Vidyalaya, Kargahar, Rohtas, Bihar. The findings of the study may help healthcare professionals, particularly nurses, school authorities, and policymakers, to plan appropriate preventive strategies, health education programs, and nutritional interventions for improving the health status of school-aged children.

STATEMENT OF THE PROBLEM:

A study to assess the prevalence of Vitamin D deficiency among school-aged children at selected school, Rohtas, Bihar.

OBJECTIVES OF THE STUDY

- To assess the prevalence of Vitamin D deficiency among school-aged children.
- To associate the prevalence vitamin D deficiency among school going child with selected demographic variables

OPERATIONAL DEFINITION

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ASSESS: - It refers to the process of identifying and measuring the prevalence of Vitamin D deficiency among school-aged children using the structured assessment tool prepared by the researcher.

PREVALENCE: - It refers to the number of school-aged children who are found to have Vitamin D deficiency at a particular period of time.

VITAMIN D DEFICIENCY: - It refers to the presence of signs, symptoms, and risk factors suggestive of Vitamin D deficiency as assessed through the structured checklist used in the study.

SCHOOL-AGED CHILDREN: - It refers to children between the age group of 6–12 years studying in selected schools.

HYPOTHESIS

H_1 (Research Hypothesis):

There is a significant association between the prevalence of Vitamin D deficiency and selected demographic variables among school-aged children.

H_2 (Research Hypothesis):

There is a significant association between the prevalence of Vitamin D deficiency and selected demographic variables among school-aged children.

ASSUMPTIONS

- vitamin D deficiency may exist among school-aged children in the selected school.
- The prevalence of Vitamin D deficiency can be assessed at the time of data

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collection.

- Parents and children may lack awareness regarding the importance of Vitamin D.

DELIMITATION

The study is delimited to:

- School-aged children between 6–12 years of age.
- Children who are present at the time of data collection.
- Children studying in selected schools of Bihar.
- Children who are willing to participate in the study.

CONCEPTUAL FRAMEWORK

The conceptual framework of the present study was based on the **Input–Throughput–Output (IPO) Model**, which provides a systematic approach for assessing the prevalence of Vitamin D deficiency among school-aged children.

Input: Demographic characteristics of school-aged children, including age, gender, class of study, dietary habits, sunlight exposure, socio-economic status, and parental education.

Throughput: Data collection using a structured questionnaire and observation checklist to assess demographic characteristics and identify Vitamin D deficiency based on clinical indicators.

Output: Determination of the prevalence of Vitamin D deficiency and its association with selected demographic variables among school-aged children.

RESEARCH APPROACH

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A **quantitative research approach** was adopted for the present study to assess the prevalence of Vitamin D deficiency among school-aged children in a selected school of Rohtas, Bihar.

RESEARCH DESIGN

Research design refers to the overall plan or blueprint for conducting a study and obtaining answers to the research questions.

A **descriptive cross-sectional research design** was adopted for the present study. This design was considered appropriate as it enabled the researcher to assess the prevalence of Vitamin D deficiency and its association with selected demographic variables among school-aged children at a single point in time without any intervention.

Schematic Representation of the Research Design

- **Research Design:** Descriptive Cross-sectional Study
- **Study Setting:** Rajkiya Aadarsh Madhya Vidyalaya, Kargahar, Rohtas, Bihar
- **Target Population:** School-aged children (6–12 years)
- **Accessible Population:** School-aged children studying at the selected school
- **Sample Size:** 60
- **Sampling Technique:** Non-probability convenience sampling
- **Data Collection Tool:** Structured assessment checklist developed by the researcher
- **Assessment:** Assessment of the prevalence of Vitamin D deficiency
- **Data Analysis:** Descriptive and inferential statistics
- **Study Findings and Conclusion**

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RESEARCH VARIABLES

The variables included in the present study were:

Demographic Variables

- Age
- Gender
- Class of study
- Educational status of father
- Educational status of mother
- Type of diet
- Daily sunlight exposure
- Physical activity

SETTING OF THE STUDY

The present study was conducted at **Rajkiya Aadarsh Madhya Vidyalaya, Kargahar, Rohtas, Bihar**. The school is a government middle school providing education from Classes I to VIII. At the time of data collection, the school had a total enrolment of approximately **320 students**. For the present study, **60 school-aged children (6–12 years of age)** who fulfilled the inclusion criteria were selected using a **non-probability convenience sampling technique**.

POPULATION

Population refers to the entire group of individuals who possess the characteristics of interest to the researcher.

Target Population

The target population comprised **all school-aged children (6–12 years of age).**

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Accessible Population

The accessible population comprised **school-aged children (6–12 years of age) studying at Rajkiya Aadarsh Madhya Vidyalaya, Kargahar, Rohtas, Bihar.**

SAMPLE

The sample consisted of **60 school-aged children (6–12 years of age)** studying at Rajkiya Aadarsh Madhya Vidyalaya, Kargahar, Rohtas, Bihar, who fulfilled the inclusion criteria.

SAMPLE SIZE

The sample size of the present study comprised **60 school-aged children.**

SAMPLING TECHNIQUE

A **non-probability convenience sampling technique** was used to select the study participants.

SAMPLING CRITERIA

Inclusion Criteria

- School-aged children between **6 and 12 years of age**.
- Children studying at the selected school.
- Children who were present during the period of data collection.
- Children who were willing to participate in the study.

Exclusion Criteria

- Children who were absent during data collection.
- Children who were unwilling to participate in the study.
- Children with known chronic illnesses or conditions affecting Vitamin D metabolism.

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Development and Description of the Tool

The data collection instrument was developed after an extensive review of the literature, consultation with experts, and the investigator's guidance. The tool consisted of two sections.

Section A: This section included demographic variables such as age, gender, class of study, educational status of father, educational status of mother, type of diet, sunlight exposure, and physical activity.

Section B: This section consisted of a structured assessment checklist developed by the investigator to assess the prevalence of Vitamin D deficiency among school-aged children. The checklist contained **20 items** covering **clinical signs and symptoms, dietary practices, sunlight exposure, lifestyle factors, and available health records (if any).**

Each item was scored as **Yes = 1** and **No = 0**. The total score ranged from **0 to 20**, with higher scores indicating a greater likelihood of Vitamin D deficiency.

The scores were interpreted as follows:

Score	Interpretation
0–6	No evidence of Vitamin D deficiency
7–13	Possible Vitamin D deficiency
14–20	Vitamin D deficiency present

The classification was based on the presence of clinical signs and symptoms, inadequate dietary intake, insufficient sunlight exposure, and unhealthy lifestyle practices.

Content Validity

The content validity of the data collection tool was established by a panel of experts from

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the departments of **Pediatric Nursing, Community Health Nursing, and Medicine**. The tool was evaluated for **relevance, clarity, simplicity, adequacy, and appropriateness**. Necessary modifications were made based on the suggestions of the experts before the final administration of the tool.

Data Collection Procedure

Data were collected over a period of **five days** at **Rajkiya Aadarsh Madhya Vidyalaya, Kargahar, Rohtas, Bihar**, after obtaining administrative permission from the school principal. The purpose of the study was explained to the parents/guardians and participating children, and written informed consent was obtained from the parents/guardians before data collection.

A total of **60 school-aged children (6–12 years)** who met the inclusion criteria were selected using a **non-probability convenience sampling technique**. Socio-demographic information was collected using a structured demographic proforma. The prevalence of Vitamin D deficiency was assessed using a structured assessment checklist comprising clinical signs and symptoms, dietary practices, sunlight exposure, and lifestyle-related factors. As the study employed a descriptive cross-sectional design, no intervention was administered. The collected data were coded, tabulated, and prepared for statistical analysis.

Statistical Analysis

The collected data were analyzed using descriptive and inferential statistics.

- **Descriptive statistics** (frequency and percentage) were used to summarize socio-demographic characteristics, Vitamin D-related factors, clinical indicators, and the prevalence of Vitamin D deficiency.

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- **Inferential statistics** using the **Chi-square test** were applied to determine the association between the prevalence of Vitamin D deficiency and selected demographic variables. A **p-value < 0.05** was considered statistically significant.

Ethical Considerations

Ethical approval and administrative permission were obtained from the concerned authorities before the commencement of the study. Permission to conduct the study was obtained from the Principal of **Rajkiya Aadarsh Madhya Vidyalaya, Kargahar, Rohtas, Bihar**. Written informed consent was obtained from the parents or guardians of all participating children prior to data collection. Participation was voluntary, and participants were informed of their right to withdraw from the study at any stage without any consequences. Confidentiality and anonymity of the participants were maintained throughout the study, and the collected data were used solely for research purposes.

RESULT

Table 4.1

Frequency and Percentage Distribution of Socio-Demographic Variables among School-Aged Children

N = 60

S.No	Demographic Variables	Frequency (n)	Percentage (%)
1	**Age (Years)**		
A	6–8 years	18	30.0
B	9–10 years	22	36.7
C	11–12 years	20	33.3

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2	**Gender**		
A	Male	32	53.3
B	Female	28	46.7
3	**Class of Study**		
A	Class I–III	20	33.3
B	Class IV–V	22	36.7
C	Class VI–VII	18	30.0
4	**Educational Status of Father**		
A	No Formal Education	12	20.0
B	Primary Education	18	30.0
C	Secondary Education	20	33.3
D	Higher Secondary & Above	10	16.7
5	**Educational Status of Mother**		
A	No Formal Education	15	25.0
B	Primary Education	20	33.3
C	Secondary Education	17	28.3
D	Higher Secondary & Above	8	13.4
6	**Type of Diet**		
A	Vegetarian	25	41.7
B	Mixed Diet	35	58.3
7	**Daily Sunlight Exposure**		
A	Less than 30 minutes	28	46.7
B	30–60 minutes	20	33.3
C	More than 60 minutes	12	20.0
8	**Physical Activity per Day**		
A	Less than 30 minutes	30	50.0
B	30–60 minutes	18	30.0
C	More than 60 minutes	12	20.0

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Table 4.2

Frequency and Percentage Distribution of Vitamin D Related Factors

N = 60

Factors	Adequate n (%)	Inadequate n (%)
Milk intake	20 (33.3%)	40 (66.7%)
Egg intake	18 (30.0%)	42 (70.0%)
Fish intake	15 (25.0%)	45 (75.0%)
Outdoor play	22 (36.7%)	38 (63.3%)
Screen time (>2 hrs/day)	18 (30.0%)	42 (70.0%)

Table 4.3

Clinical Indicators Related to Vitamin D Deficiency

N = 60

S.No	Signs & Symptoms	Yes n (%)	No n (%)
1	Bone pain	18 (30.0%)	42 (70.0%)
2	Muscle weakness	20 (33.3%)	40 (66.7%)
3	Delayed growth	15 (25.0%)	45 (75.0%)
4	Frequent illness/infections	25 (41.7%)	35 (58.3%)
5	Bowing of legs	10 (16.7%)	50 (83.3%)
6	Dental problems	22 (36.7%)	38 (63.3%)
7	Fatigue/low energy	28 (46.7%)	32 (53.3%)

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Table 4.4

Prevalence of Vitamin D Deficiency among School-Aged Children

Level	Frequency	Percentage (%)
Deficient	28	46.7
Not Deficient	32	53.3
Total	60	100

Table 4.5

Association between Prevalence of Vitamin D Deficiency and Selected Demographic Variables among School-Aged Children

(N = 60)

Demographic Variable	χ^2 Value	df	Table Value	Significance

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Age	4.82	2	5.99	NS
Gender	0.78	1	3.84	NS
Educational Status of Father	2.34	3	7.81	NS
Educational Status of Mother	1.96	3	7.81	NS
Type of Diet	5.12	1	3.84	S
Sunlight Exposure	7.45	2	5.99	S
Physical Activity	6.20	2	5.99	S

Major Findings of the Study

A total of **60 school-aged children** participated in the study. The majority of the participants **22 (36.7%)** belonged to the **9–10 years** age group, **32 (53.3%)** were male, and **35 (58.3%)** consumed a mixed diet. Nearly half of the children **28 (46.7%)** had **less than 30 minutes of daily sunlight exposure**, while **30 (50.0%)** engaged in **less than 30 minutes of physical activity** per day.

Assessment of dietary and lifestyle factors revealed that **40 (66.7%)** children had inadequate milk intake, **42 (70.0%)** had inadequate egg intake, **45 (75.0%)** had inadequate fish intake, **38 (63.3%)** had reduced outdoor play activity, and **42 (70.0%)** had screen time exceeding two hours per day.

Among the clinical indicators, **fatigue or low energy** was the most frequently reported symptom (**28, 46.7%**), followed by **frequent illness or infections** (**25, 41.7%**) and **dental problems** (**22, 36.7%**).

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The study revealed that **28 (46.7%)** children were found to have **Vitamin D deficiency**, whereas **32 (53.3%)** were not deficient.

Chi-square analysis demonstrated a **statistically significant association** between Vitamin D deficiency and **type of diet ($\chi^2 = 5.12$)**, **sunlight exposure ($\chi^2 = 7.45$)**, and **physical activity ($\chi^2 = 6.20$)** at the **$p < 0.05$** level. However, no statistically significant association was observed with **age ($\chi^2 = 4.82$)**, **gender ($\chi^2 = 0.78$)**, **educational status of father ($\chi^2 = 2.34$)**, or **educational status of mother ($\chi^2 = 1.96$)** ($p > 0.05$).

Implications for Nursing Practice

The findings of the present study have important implications for nursing practice. School and community health nurses can play a significant role in the early identification of children at risk of Vitamin D deficiency through regular nutritional assessment and school health screening. The study emphasizes the need for nurses to provide health education to children and their parents regarding adequate sunlight exposure, balanced nutrition, regular physical activity, and healthy lifestyle practices. The findings may also assist nurses in planning and implementing school-based health promotion programmes aimed at preventing Vitamin D deficiency and improving the nutritional status of school-aged children.

Limitations

The present study had certain limitations. The study was conducted among **60 school-aged children** from a single government school in Rohtas, Bihar; therefore, the findings cannot be generalized to all school-aged children. Vitamin D deficiency was assessed using a structured assessment checklist based on clinical signs, dietary practices, sunlight exposure, and lifestyle-related factors, and **laboratory estimation of serum 25-hydroxyvitamin D**

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[25(OH)D] levels was not performed. Furthermore, the cross-sectional design of the study limited the establishment of causal relationships between Vitamin D deficiency and the associated factors.

Recommendations

Future studies may be conducted with a larger sample size involving multiple schools from different geographical areas to improve the generalizability of the findings. Comparative studies between urban and rural school-aged children are recommended to identify regional variations in Vitamin D deficiency. Further research incorporating laboratory estimation of serum 25-hydroxyvitamin D [25(OH)D] levels is also recommended to improve diagnostic accuracy. Interventional studies evaluating the effectiveness of nutritional education, Vitamin D supplementation, and school-based health promotion programmes may provide stronger evidence for the prevention and control of Vitamin D deficiency among school-aged children.

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