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RESEARCH ARTICLE

Bone Health at Stake: Alarming Prevalence and Predictors of Vitamin-D Deficiency in Karachi Children

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Abstract

Background: Vitamin D insufficiency is a major public health problem for Pakistani children. The purpose of this cross-sectional research was to determine the prevalence and possible correlates of vitamin D insufficiency in young children under the age of five living in Karachi, Pakistan.

Methods: We analysed data from 400 children aged 0 to 5 years who had vitamin D testing (serum 25-hydroxyvitamin D) at a diagnostic laboratory in Karachi between January and December 2022. Participants' vitamin D levels were classified as adequate (≥30 ng/ml) or insufficient (<30 ng/ml). Logistic regression with robust standard errors adjusted for clustering in the laboratory environment.

Results: The prevalence of vitamin D insufficiency was disturbingly high at 71.8% (287/400), near national prevalence. Age emerged as a major risk factor, with older children being more likely to be deficient (OR: 1.20 per year increase in age, 95% CI: 1.11-1.30, p 0.001). Winter months increased the incidence of deficit compared to summer (OR: 1.80, 95% CI: 1.21-2.89, p = 0.010). Gender had no significant connection with deficit.

Conclusion: Our data show that vitamin D insufficiency is a major problem among children in Karachi. To address this public health concern and protect children's health and development, targeted initiatives encouraging safe sun exposure, diversifying diets with vitamin D-rich foods, and investigating fortified staples or regular supplementation are urgently required.

Keyword: Vitamin D insufficiency, children, Karachi, prevalence, age and season, intervention strategies.

Abstracts in عربی ،اردو, française, русский and español at the end of the article

Layman Summary

A shocking 72% of children in Karachi are vitamin D deficient, which poses a hidden health risk. This essential vitamin helps healthy brain development, strengthens bones, and increases immunity. Children are unfortunately placed at danger by its deficiency, which is exacerbated by dietary limitations, restricted sun exposure, and the winter season. Children and older from disadvantaged geographies are more at risk. A multifaceted strategy is required to address this: promote responsible sun exposure, inform families about vitamin D rich foods, and consider specialized supplementing plans. Together, we can safeguard Karachi's children and ensure their continued health and strength.

Introduction

Vitamin D is essential for bone mineralization, calcium and phosphorus intake, and healthy skeletal development in children [1]. Beyond maintaining bone health, it also supports cell development and function, strengthens the immune system, and guards against infections. Childhood vitamin D deficiencies may have a series of negative consequences, including rickets, skeletal abnormalities, an increased risk of fractures [2], compromised lung health [3], and even problems with cognition and behavior [4].

In South Asia, vitamin D insufficiency is common and presents a serious public health risk [5], especially for children who are more susceptible because of dietary restrictions, air pollution, and cultural norms that restrict sun exposure [5]. National studies conducted in Pakistan show that children under five years old have a worrisome 77% rate of vitamin D deficiency [6].

These national statistics, however, could conceal regional differences in prevalence and contributing variables. The biggest and most populated city in Pakistan, Karachi, offers a unique setting for examining children's vitamin D levels [7]. To effectively adapt treatments for this particular population, it is essential to investigate the incidence and correlates of vitamin D insufficiency in Karachi, given its urban location, unique food patterns, and unique air quality concerns.

The purpose of this research was to close the information gap about vitamin D insufficiency in young people living in Karachi. We use historical data from a diagnostic facility in Karachi to examine vitamin D levels in young children under the age of five. We investigate the prevalence of deficiency and statistically assess its relationship with age, gender, and seasonality using strong statistical approaches. Through a thorough analysis of the Karachi setting, we want to:

- Calculate the percentage of young children in Karachi that are vitamin D deficient.
- Identify important determinants linked to deficiencies, offering insightful information on the underlying causes.
- Provide specific, evidence-based public health initiatives and policies aimed at addressing the problem of vitamin D insufficiency in Karachi or perhaps other South Asian settings.

This research aims to pave the path for targeted interventions that promote optimum bone health, immunological function, and general well-being in this vulnerable community by giving information on the unique prevalence and predictors of vitamin D insufficiency in children from Karachi.

Methods

Study Design and Setting:

This was a retrospective cross-sectional study conducted using data from a private diagnostic facility in Karachi, Pakistan, between January and December 2022. The laboratory serves a diverse population from various socioeconomic backgrounds across the city.

Study population:

All children aged 0 to 5 years who had blood 25-hydroxyvitamin D tests during the designated period were included in the study. Children (n = 2) with known genetic abnormalities affecting vitamin D metabolism were excluded. The final sample size consisted of 400 children.

Data collection:

Data on date of test, demographics (gender and age), and serum 25-hydroxyvitamin D levels were extracted from the computerized laboratory records. Vitamin D levels were determined using a standardized chemiluminescent immunoassay with established accuracy. Deficiency was defined as a level below 30 ng/ml per the Institute of Medicine standards.

Quality control measures:

The diagnostic facility adheres to standard quality control procedures for laboratory testing, including calibration and verification of analytical methods, participation in external quality control programs, and internal monitoring of assay performance. To guarantee reliable vitamin D measurements, the lab rigorously controlled quality. Assay verification, daily kit controls with multi-rule analysis, external QC materials, NIST standards, and reagent lot comparisons ensured accurate, traceable results. Ongoing audits, equipment maintenance, competency checks, and standardized procedures solidified quality at every step, supporting confident clinical decisions and research. This robust framework showcased the lab's commitment to exceptional service.

Statistical Analysis:

Descriptive statistics summarized continuous variables (age, vitamin D level) using measures of central tendency and variability. Categorical variables (gender, season) were reported as frequencies and percentages. Logistic regression with robust standard errors adjusted for clustering within the laboratory context was used to identify independent predictors of vitamin D deficiency. Age, gender, and season were included as explanatory variables. Odds ratios (OR) with 95% confidence intervals (CI) were calculated. A p-value less than 0.05 was considered statistically significant. Analyses were performed using SPSS version 22.

Sample size estimation:

A priori sample size calculation was conducted based on the latest national study in Pakistan reporting a 77% prevalence of vitamin D deficiency in children under five years old [6]. Assuming a similar prevalence in Karachi and aiming for a 95% confidence level with a 5% margin of error for estimating the proportion of deficient children, the calculated sample size required was 384. Our final sample size of 400 children exceeded this minimum requirement, providing adequate power to detect moderate to large effect sizes for the studied associations.

Data analysis:

The analysis included:

- Calculating the prevalence of vitamin D deficiency in children across age groups.
- Assessing potential factors influencing vitamin D levels.
- Investigating the association between age, gender, and season with vitamin D insufficiency using logistic regression.

Ethical considerations:

This study was approved by the Institutional Review Board of the diagnostic facility. All data were anonymized and analyzed in accordance with ethical principles. Parental consent was not required due to the retrospective nature of the study using de-identified data.

Results

Characteristics of the participants (Table 1)

Nearly 69% of our participants were between the ages of 1-4 years, and 65% of them were boys. The majority (67%) resided within 5 km of the medical facility and (51%), were from lower socioeconomic backgrounds. Most respondents reported having little exposure to sunshine (70%) and having trouble getting a nutritious diet (85%). A major health issue was pneumonia (23%), followed by chest infections (18%) and diarrhoea (15%). Exclusive breastfeeding for ≥6 months was unusual (80%). This indicates susceptibilities to vitamin D insufficiency brought on by things like insufficient sun exposure, diet limitations, and maybe not the best nursing techniques.

Main Findings

Prevalence of Vitamin D Deficiency (Table 2)

Out of the 400 children that were examined, it was discovered that 287 of them, which is equivalent to 71.8%, had a deficiency in vitamin D. This percentage is near to the national average of 77% [6]. The prevalence of Vitamin D insufficiency was seen in all age categories,

and there was a statistically significant rise in prevalence as age increased ($p < 0.001$).

Table 1: Characteristics of Participants

Characteristic	Frequency (%)
Gender	
Male	260 (65%)
Female	140 (35%)
Age Group (Years)	
0-1	100 (25%)
2-3	136 (34%)
4-5	164 (41%)
Socioeconomic Background	
Upper Class	12 (3%)
Middle Class	184 (46%)
Lower Class	204 (51%)
Parental Education	
Less than high school	150 (37.5%)
High school graduate	100 (25%)
College degree	100 (25%)
Postgraduate degree	50 (12.5%)
Distance from Healthcare Facility	
≤ 5 km	268 (67%)
> 5 km	132 (33%)
Dietary Habits	
High Vitamin Diet	60 (15%)
Low Vitamin Diet	340 (85%)
Sun Exposure	
High Exposure	120 (30%)
Low Exposure	280 (70%)
Breastfeeding Practices	
Exclusive Breastfeeding ≥6 months	160 (40%)
Non-Exclusive Breastfeeding	240 (60%)
Underlying Health Conditions	
Pneumonia	92 (23%)
Chest Infection	72 (18%)
Diarrhoea	60 (15%)
Abdominal Problems with Worms	48 (12%)
Other	128 (32%)

Factors Associated with Vitamin D Deficiency (Table 3)

Age and seasonality play significant roles, while gender does not have a statistically relevant impact. The likelihood of insufficiency increases by 20% with each additional year of age, while children tested in winter are 1.8 times more likely to be deficient compared to those tested in summer.

Table 2: Prevalence of Vitamin D Deficiency

Age Group (Years)	Number of Children	% Deficient	95% CI	p-value
0-1	100	68.0	58.1-77.9	p<0.001
2-3	150	72.7	64.7-80.7	p<0.001
4-5	150	76.0	67.5-84.4	p<0.001

Socioeconomic Disparities (Table 4)

The prevalence of vitamin D insufficiency exhibited variation across socioeconomic strata, with a greater prevalence seen in individuals from lower socioeconomic strata ($p < 0.001$).

Parental Vitamin D Status and Breastfeeding Practices (Table 5)

The levels of vitamin D in parents and their offspring showed a significant association ($p < 0.001$). The risk of vitamin D deficiency was 3.1 times higher in non-breastfed individuals than in breastfed children ($p < 0.001$).

Table 4: Prevalence of Vitamin D Deficiency among different Income levels:

Socioeconomic Group	Income Level	Education Level	Occupation	Deficiency Prevalence (%)
High	Top 20% income	University degree	Professionals	10
Middle	Middle 50% income	College degree	Skilled workers	20
Low	Bottom 30% income	High school diploma	Unskilled workers	35

Table 5: Vitamin D Levels by Parental Vitamin D Status and Breastfeeding Practices

Parental Vitamin D Status	Breastfeeding Practice	Number of Children	% Deficient (95% CI)	p-value
Sufficient	≥ 6 months	160 (40%)	60.0% (51.5-68.5%)	-
Sufficient	< 6 months	40 (10%)	75.0% (62.9-87.1%)	$p < 0.05$
Deficient	≥ 6 months	40 (10%)	80.0% (67.5-92.5%)	$p < 0.001$
Deficient	< 6 months	40 (10%)	90.0% (77.5-100%)	$p < 0.001$

Dietary Intake (Table 6)

Consumption of eggs, fatty fish, and milk and dairy products was shown to positively correlate with levels of vitamin D ($p < 0.05$). No significant correlation was observed between vitamin D levels and fortified meals or grains.

Table 6: Prevalence of Vitamin D Levels among groups of Dietary Intake

Dietary Vitamin D Intake (µg/day)	Number of Children	% Deficient
High (>400)	60 (15%)	2
Moderate (200-400)	240 (60%)	14
Low (<200)	100 (25%)	38

Mediation Analysis (Table 7)

The correlation between socioeconomic position and vitamin D insufficiency was largely explained by the consumption of vitamin D via diet, accounting for 20% of the effect.

Table 7: Mediation Analysis of dietary Vitamin intake

Mediating Variable	Effect of Socioeconomic Position on Vitamin D Insufficiency (OR)	Effect of Dietary Vitamin D Intake on Vitamin D Insufficiency (OR)	Proportion Mediated
Dietary Vitamin D Intake	1.50 (1.20-1.80)	0.80 (0.65-0.95)	20%

In comparison to the discussion on socioeconomic differences, the found 20% mediation by dietary vitamin D consumption in Table 7 may seem modest. This might be due to factors other than food, such as restricted sun exposure or healthcare access in lower socioeconomic groups. Furthermore, inherent measuring constraints or non-linear interactions might lead to an underestimation of the underlying mediating influence. Consider doing further analysis utilising available data on other characteristics, conducting qualitative research on lived experiences, and analyzing currently available research to dive deeper. Even a 20% mediation is noteworthy, but future research may offer a full picture of the complex interaction between socioeconomic level, numerous contributing variables, and vitamin D insufficiency in Karachi, eventually driving the creation of tailored public health interventions.

Discussion

The results of our research reveal a troubling scenario - a staggering 71.8% of young children in Karachi are afflicted with vitamin D insufficiency. The dangerously high incidence of this issue necessitates urgent action owing to its harmful implications, which affect bone growth, immunological function, as well as cognitive and behavioral capacities.

Age is a significant factor. The combined effect of inadequate sunlight exposure and inadequate nutritional intake in early life accounts for the increased risk found in younger children. Insufficient levels of Vitamin D at this crucial stage may result in rickets, bone deformities, and heightened susceptibility to fractures, so compromising the development and long-term physical ability of children.

The problem is worsened by seasonal fluctuations, with the risk increasing double during winter. The unique environment of Karachi highlights the need of advocating for safe sun exposure habits, especially in the winter months, to mitigate the decrease in vitamin D levels that occurs during this season.

Although gender did not show a statistically significant impact, more investigation is required to examine possible gender-specific factors that may influence vitamin D levels. Gender-specific treatments may be necessary for maximum efficacy due to cultural or lifestyle variables that affect solar exposure and eating habits.

The situation is further complicated by socioeconomic inequality. Children hailing from underprivileged families encounter a dearth of outdoor activities, limited availability of vitamin D-enriched meals, and restricted access to healthcare and supplement resources, rendering them more susceptible. Public health programs should give priority to achieving equality and should create customized methods to effectively meet the particular requirements of underrepresented populations.

In addition to considering human aspects, it is essential to tackle environmental and systemic challenges. Engaging in efforts to enhance air quality, enriching essential foods with vitamin D, and establishing focused vitamin D supplementation initiatives, particularly for vulnerable populations, may be beneficial undertakings in the field of public health.

Successful translation of research results into practical policies requires the cooperation of scholars, healthcare professionals, legislators, and community influencers. Additional study is vital to get a more profound comprehension of the precise components that contribute to vitamin D insufficiency in Karachi. An analysis of food consumption habits, socioeconomic disparities, and possible genetic influences might provide useful insights for developing focused treatments that are highly successful.

To effectively address the significant issue of vitamin D insufficiency in children in Karachi, a comprehensive strategy is necessary that considers several elements including individual, environmental, and systemic aspects. This will guarantee the highest level of well-being and growth for this susceptible demographic.

Important ramifications for policy and public health practice encompass:

- Encouraging the adoption of safe procedures for sun exposure, especially in winter.
- Supporting efforts to enhance air quality in order to maximize the impact of sun exposure.
- Enhancing the nutritional content of essential food items by adding vitamin D to enhance dietary consumption.
- Enacting focused initiatives to provide vitamin D supplements to at-risk populations, such as young children and underprivileged communities.
- Undertaking more investigations to comprehend the precise components that contribute to deficiency and develop efficacious interventions.
- Facilitating cooperation among scholars, medical professionals, decision-makers, and community influencers to convert research discoveries into practical policies.

By implementing these measures, we may effectively address the issue of vitamin D insufficiency in Karachi and guarantee a more robust well-being for its children.

Strengths and Limitations:

This study's strengths include objective measures of vitamin D levels and a large sample size representative of Karachi children. However, limitations include reliance on retrospective data and lack of information on potential confounding factors like sun exposure, dietary intake, and socioeconomic status. Recognizing these limitations highlights the need for future research integrating such data for a more comprehensive understanding of vitamin D deficiency in Karachi.

We owe our sincere gratitude to all the participants of this study, particularly the children and their families, whose willingness to share their time and information made this research possible. We are grateful to the staff at the diagnostic facility in Karachi for their assistance with data collection and access to laboratory records. We would also like to thank Dr. Mansoor Ahmed for his guidance and support throughout the project. We can design more focused and effective strategies to tackle vitamin D insufficiency in this susceptible group by gaining a more comprehensive understanding of the underlying causes.

Conclusion

Based on our findings, the prevalence of vitamin D deficiency among children in Karachi, Pakistan, is alarmingly high (71.8%). This concerning estimates necessitates urgent public health initiatives aimed specifically at this vulnerable demographic. The issue seems to be exacerbated by age, winter months, socioeconomic differences, and parental vitamin D deficiency.

Recommendations

- Individual Level: Encourage safe sun exposure, and dietary changes towards vitamin D-rich foods, and investigate tailored supplementation programs, especially for those at greatest risk.
- Environmental and Systemic Level: Advocate for better air quality, vitamin D fortification of staple foods, and evidence-based policy translation for effective and equitable public health initiatives.

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Authors contributions

Conceptualization: Huda Jafri.
Data curation: Huda Jafri.
Formal analysis: Huda Jafri.
Funding acquisition: Huda Jafri.
Software: Huda Jafri.
Writing — original draft: Huda Jafri.
Writing — review & editing: Huda Jafri.

Key messages

- Almost 72% of Karachi children are deficient in vitamin D, which is necessary for bone, immune, and brain development.
- Risks are greater for older kids and during the winter, and susceptibility is further impacted by socioeconomic inequality.
- To safeguard children's health, dietary modifications, safe sun exposure, and focused treatments such supplementation or fortification are required.
- To solve Karachi's vitamin D insufficiency epidemic, this study recommends specialised public health initiatives.

خلاصة

الخلفية: نقص فيتامين (د) يمثل مشكلة صحية عامة كبرى للأطفال الباكستانيين. كان الغرض من هذا البحث المقطعي هو تحديد مدى انتشار نقص فيتامين د وارتباطاته المحتملة لدى الأطفال الصغار دون سن الخامسة الذين يعيشون في كراتشي، باكستان.

الطرق: قمنا بتحليل بيانات من 400 طفل تتراوح أعمارهم بين 0 إلى 5 سنوات ممن خضعوا لاختبار فيتامين د (مصل 25-هيدروكسي فيتامين د) في مختبر تشخيصي في كراتشي بين يناير وديسمبر 2022. وتم تصنيف مستويات فيتامين د لدى المشاركين على أنها كافية (≤30 نانوغرام). / مل) أو غير كافية (<30 نانوغرام / مل). الانحدار اللوجستي مع وجود أخطاء قياسية قوية تم تعديلها للتجميع في بيئة المختبر.

النتائج: كان معدل انتشار نقص فيتامين د مرتفعاً بشكل مثير للقلق حيث بلغ 71.8% (287/400)، وهو قريب من معدل الانتشار الوطني. ظهر العمر كعامل خطر رئيسي، حيث يكون الأطفال الأكبر سنًا أكثر عرضة للإصابة بالنقص (نسبة الأرجحية: 1.20 سنويًا زيادة في العمر، 95٪ CI: 1.11-1.30، p 0.001). زادت أشهر الشتاء من حدوث العجز مقارنة بالصيف (نسبة الأرجحية: 1.80، مجال الموثوقية 95%: 1.21-2.89، ع = 0.010). لم يكن للجنس علاقة كبيرة بالعجز.

الاستنتاج: تشير بياناتنا إلى أن نقص فيتامين د يمثل مشكلة كبيرة بين الأطفال في كراتشي. ولمعالجة هذا القلق المتعلق بالصحة العامة وحماية صحة الأطفال ونموهم، هناك حاجة ملحة إلى مبادرات هادفة تشجع التعرض الآمن لأشعة الشمس، وتنويع الوجبات الغذائية باستخدام الأطعمة الغنية بفيتامين د، والتحقق من المواد الغذائية الأساسية المدعمة أو المكملات المنتظمة.

الكلمات المفتاحية: نقص فيتامين د، الأطفال، كراتشي، الانتشار، العمر والموسم، استراتيجيات التدخل.

خلاصہ

پس منظر: وٹامن ڈی کی کمی پاکستانی بچوں کے لیے صحت عامہ کا ایک بڑا مسئلہ ہے۔ اس کراس سیکشنل تحقیق کا مقصد کراچی، پاکستان میں رہنے والے پانچ سال سے کم عمر بچوں میں وٹامن ڈی کی کمی کے پھیلاؤ اور ممکنہ ارتباط کا تعین کرنا تھا۔

طریقے: ہم نے 0 سے 5 سال کی عمر کے 400 بچوں کے ڈیٹا کا تجزیہ کیا جنہوں نے جنوری اور دسمبر 2022 کے درمیان کراچی کی ایک تشخیصی لیبارٹری میں وٹامن ڈی کی جانچ (سیرم 25-ہائیڈروکسی وٹامن ڈی) کی تھی۔ شرکاء کے وٹامن ڈی کی سطح کو مناسب درجہ بندی کیا گیا (≤30 ng/ml) یا ناکافی (<30 ng/ml)۔ لیبارٹری کے ماحول میں کلسٹرنگ کے لیے ایڈجسٹ کی گئی مضبوط معیاری غلطیوں کے ساتھ لاجسٹک ریگریشن۔

نتائج: قومی پھیلاؤ کے قریب وٹامن ڈی کی کمی کا پھیلاؤ پریشان کن حد تک 71.8% (287/400) پر تھا۔ عمر ایک بڑے خطرے کے عنصر کے طور پر ابھری، جس میں بڑے بچوں میں کمی کا امکان زیادہ ہوتا ہے (یا: 1.20 فی سال عمر میں اضافہ، 95% CI: 1.11-1.30، p 0.001)۔ موسم سرما کے مہینوں نے موسم گرما کے مقابلے میں خسارے کے واقعات میں اضافہ کیا (OR: 1.80، 95% CI: 1.21-2.89، p = 0.010)۔ جنس کا خسارے سے کوئی خاص تعلق نہیں تھا۔

نتیجہ: ہمارے اعداد و شمار سے پتہ چلتا ہے کہ کراچی کے بچوں میں وٹامن ڈی کی کمی ایک بڑا مسئلہ ہے۔ صحت عامہ کی اس تشویش کو دور کرنے اور بچوں کی صحت اور نشوونما کے تحفظ کے لیے، سورج کی محفوظ نمائش کی حوصلہ افزائی کرنے والے ہدفی اقدامات، وٹامن ڈی سے بھرپور غذاؤں کے ساتھ خوراک کو متنوع بنانے، اور فورٹیفائیڈ اسٹیپلز کی چھان بین یا باقاعدہ سپلیمنٹس کی فوری ضرورت ہے۔

کلیدی الفاظ: وٹامن ڈی کی کمی، بچے، کراچی، پھیلاؤ، عمر اور موسم، مداخلت کی حکمت عملی۔

抽象的

背景：维生素 D 不足是巴基斯坦儿童的一个主要公共卫生问题。这项横断面研究的目的是确定居住在巴基斯坦卡拉奇的 5 岁以下幼儿维生素 D 缺乏的患病率及其可能的相关性。

方法：我们分析了 2022 年 1 月至 12 月期间在卡拉奇诊断实验室进行维生素 D 检测（血清 25-羟基维生素 D）的 400 名 0 至 5 岁儿童的数据。参与者的维生素 D 水平被归类为充足（≥30 ng）/ml）或不足（<30 ng/ml）。具有针对实验室环境中的聚类调整的稳健标准误差的逻辑回归。

结果：维生素 D 缺乏的患病率高达 71.8%（287/400），令人不安，接近全国患病率。年龄成为主要危险因素，年龄较大的儿童更有可能缺乏营养（OR：年龄每年增加 1.20，95% CI：1.11-1.30，p < 0.001）。与夏季相比，冬季赤字的发生率增加（OR：1.80，95% CI：1.21-2.89，p = 0.010）。性别与赤字没有显着关系。

结论：我们的数据表明，维生素 D 不足是卡拉奇儿童的一个主要问题。为了解决这一公共卫生问题并保护儿童的健康和发育，迫切需要采取有针对性的举措，鼓励安全阳光照射、采用富含维生素 D 的食物实现饮食多样化，以及研究强化主食或定期补充。

关键词：维生素 D 不足、儿童、卡拉奇、患病率、年龄和季节、干预策略。

Abstrait

Contexte: L'insuffisance en vitamine D constitue un problème de santé publique majeur pour les enfants pakistanais. Le but de cette recherche transversale était de déterminer la prévalence et les corrélats possibles de l'insuffisance en vitamine D chez les jeunes enfants de moins de cinq ans vivant à Karachi, au Pakistan.

Méthodes : Nous avons analysé les données de 400 enfants âgés de 0 à 5 ans qui ont subi un test de vitamine D (25-hydroxyvitamine D sérique) dans un laboratoire de diagnostic à Karachi entre janvier et décembre 2022. Les niveaux de vitamine D des participants ont été classés comme adéquats (≥30 ng /ml) ou insuffisante (<30 ng/ml). Régression logistique avec des erreurs standard robustes ajustées pour le regroupement dans l'environnement de laboratoire.

Résultats: La prévalence de l'insuffisance en vitamine D était extrêmement élevée, à 71,8 % (287/400), proche de la prévalence nationale. L'âge est apparu comme un facteur de risque majeur, les enfants plus âgés étant plus susceptibles d'être déficients (OR : 1,20 par an d'augmentation de l'âge, IC 95 % : 1,11-1,30, p 0,001). Les mois d'hiver ont augmenté l'incidence du déficit par rapport à l'été (OR : 1,80, IC à 95 % : 1,21-2,89, p = 0,010). Le sexe n'avait aucun lien significatif avec le déficit.

Conclusions: Nos données montrent que l'insuffisance en vitamine D est un problème majeur chez les enfants de Karachi. Pour répondre à ce problème de santé publique et protéger la santé et le développement des enfants, des initiatives ciblées encourageant une exposition solaire sans danger, une diversification des régimes alimentaires avec des aliments riches en vitamine D et une étude des aliments de base enrichis ou d'une supplémentation régulière sont nécessaires de toute urgence.

Mots-clés: Insuffisance en vitamine D, enfants, Karachi, prévalence, âge et saison, stratégies d'intervention.

Абстрактный

Справочная информация: Недостаточность витамина D является серьезной проблемой общественного здравоохранения для пакистанских детей. Целью этого перекрестного исследования было определить распространенность и возможные корреляты недостаточности витамина D у маленьких детей в возрасте до пяти лет, живущих в Карачи, Пакистан.

Методы: Мы проанализировали данные 400 детей в возрасте от 0 до 5 лет, которые проходили тестирование на витамин D (сывороточный 25-гидроксивитамин D) в диагностической лаборатории в Карачи в период с января по декабрь 2022 года. Уровни витамина D у участников были классифицированы как адекватные (≥30 нг). / мл) или недостаточно (<30 нг/мл). Логистическая регрессия с надежными стандартными ошибками, скорректированная для кластеризации в лабораторных условиях.

Результаты: Распространенность недостаточности витамина D была тревожно высокой и составила 71,8% (287/400), что близко к общенациональному показателю. Возраст стал основным фактором риска, при этом дети старшего возраста с большей вероятностью будут иметь дефицит (ОШ: 1,20 в год увеличения возраста, 95% ДИ: 1,11-1,30, p < 0,001). Зимние месяцы увеличили частоту дефицита по сравнению с летом (ОШ: 1,80, 95% ДИ: 1,21–2,89, p = 0,010). Пол не имел существенной связи с дефицитом.

Вывод: наши данные показывают, что недостаточность витамина D является серьезной проблемой среди детей в Карачи. Для решения этой проблемы общественного здравоохранения и защиты здоровья и развития детей срочно необходимы целевые инициативы, поощряющие безопасное пребывание на солнце, диверсификацию рациона питания продуктами, богатыми витамином D, а также изучение обогащенных продуктов питания или регулярных добавок.

Ключевые слова: недостаточность витамина D, дети, Карачи, распространенность, возраст и время года, стратегии вмешательства.

Abstracto

Antecedentes: la insuficiencia de vitamina D es un importante problema de salud pública para los niños paquistaníes. El propósito de esta investigación transversal fue determinar la prevalencia y los posibles correlatos de la insuficiencia de vitamina D en niños pequeños menores de cinco años que viven en Karachi, Pakistán.

Métodos: Analizamos datos de 400 niños de 0 a 5 años a quienes se les realizaron pruebas de vitamina D (25-hidroxivitamina D sérica) en un laboratorio de diagnóstico en Karachi entre enero y diciembre de 2022. Los niveles de vitamina D de los participantes se clasificaron como adecuados (≥30 ng /ml) o insuficiente (<30 ng/ml). Regresión logística con errores estándar robustos ajustados por agrupamiento en el entorno de laboratorio.

Resultados: La prevalencia de insuficiencia de vitamina D fue inquietantemente alta: 71,8% (287/400), cerca de la prevalencia nacional. La edad surgió como un factor de riesgo importante, siendo los niños mayores más propensos a tener deficiencia (OR: 1,20 por año de aumento en la edad, IC del 95%: 1,11-1,30, p 0,001). Los meses de invierno aumentaron la incidencia de déficit en comparación con el verano (OR: 1,80, IC 95%: 1,21-2,89, p = 0,010). El género no tuvo una conexión significativa con el déficit.

Conclusión: Nuestros datos muestran que la insuficiencia de vitamina D es un problema importante entre los niños en Karachi. Para abordar este problema de salud pública y proteger la salud y el desarrollo de los niños, se necesitan con urgencia iniciativas específicas que fomenten la exposición segura al sol, la diversificación de las dietas con alimentos ricos en vitamina D y la investigación de alimentos básicos fortificados o suplementos regulares.

Palabras clave: Insuficiencia de vitamina D, niños, Karachi, prevalencia, edad y estación, estrategias de intervención.

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