Review Article

A Systematic Review and Meta-analysis on Factors Influencing Academic Achievement of Children and Adolescents

*Bishnu K. Adhikari[1], Prakash Sharma [2]**

[1] Department of Health, Physical and Population Education, Sanothimi Campus, Faculty of Education, Tribhuvan University, Bhaktapur, Nepal

[2] Department of Education, Butwal Multiple Campus, Faculty of Education, Tribhuvan University, Butwal, Nepal

*Email: prakasharma35@gmail.com

Article History

Received: Aug 12, 2025
Revised: Aug 18, 2025
Accepted: Sept 1, 2025

Abstract:

Background: Academic achievement is crucial for public health concerns because it significantly impacts future academic success. However, the factors influencing the academic achievement of children and adolescents remain unclear. Objectives: To synthesize and critically evaluate the findings of systematic review on the factors influencing academic achievement in children and adolescents through meta-analysis. Methods: A systematic literature search was conducted from different databases for meta-analysis. Articles were extracted from scholar.google.com, Pubmed.com, eric.ed.gov, Elicit.com, sematicscholar.com to identify related studies published between 2015 to 2025 using PRISMA flow diagram. Approximately 120 full text papers were initially identified. Among them, irrelevant papers were excluded. After screening 12 studies, met the inclusion criteria, which were included in meta-analysis of this review. Selected articles and results of them were examined and synthesized in sub headings through thematic analysis. Results: This study showed that out of total, 83.33% articles used cross-sectional and 16.67% used longitudinal research design in this reviewed study. The majority (25%) of healthy home food environment and breakfast were found as the influencing factors of academic achievement followed by poverty and sedentary life styles, proceed food, energy dense diet, balance diet, fruits and vegetables, Mediterranean diet, inflammatory and anti-inflammatory diet were found 25%, 16.67%, 16.67%. 8.33% and 8.33% respectively as the influencing factors of academic achievement of children and adolescents. Conclusion: The study concluded that academic achievement of children and adolescents is influenced by various factors. Mainly the dietary intake home food environment and breakfast as well as poverty and life styles. Even though, the rigorous design, control of biases and confounding variables are necessary to conform this association.

Key words: Academic achievement, Influencing factor, Children and Adolescent

DOI: 10.56580/GEOMEDI66

Introduction

Academic achievement is not only important to educators, parents, and children, but it is also vital for public health concern, since it has a big impact on future academic success [1]. A person's future is significantly influenced by their academic performance during their childhood and adolescence [2]. The academic success includes the attainment of educational objectives, the cultivation of vital skills and competencies, personal fulfillment, persistence and post-college performance [3]. Academic achievement serves as a foundation for their critical thinking skills, cognitive development and overall academic behaviors [4]. Diet and lifestyle are the behaviors that can be altered to influence brain development, cognition and ultimately academic achievement. The cognitive development is directly linked with eating breakfast [5]. Food behavior is the major contributor to health-related issues in the world. Specifically in long term health problems [6]. A previous study found that children and adolescents who eat fewer nutrient-dense foods like fruits, vegetables, fish and more unhealthy meals like fast food and highly processed foods performed worse academically. Similarly, nutritional diet may have direct, indirect, and synergistic effects on the brain and cognition in addition to physical activity, sedentary lifestyles, cardio metabolic health, and sleep [7]. In this scenario, no previous systematic review or meta-analysis has looked at the relationship between adherence to the factors that influence children's and adolescents' academic achievement. The existing research often focuses on specific eating patterns rather than broader dietary patterns [8]. In this context, understanding this connection is essential to the implications for individual well-being of children and adolescents. Therefore, the aim of the present study was to synthesize and critically evaluate the findings of systematic review on the factors influencing academic achievement in children and adolescents through meta-analysis.

Materials and Methods

Systematic literatures were searched from different databases for meta-analysis. Articles were extracted from scholar.google.com, Pubmed.com, eric.ed.gov, Elicit.com, sematicscholar.com to identify related studies published between 2015 to 2025. The search was performed from January 15 to February 16, 2025, using predefined key words. which were 'academic achievement, Influencing factor, children and adolescent.' From this process approximately 120 full text papers were initially identified. Among them, irrelevant papers were excluded. These studies were assessed on the basis of inclusion and exclusion criteria. Only the studies published in English and focusing on academic achievement as well as its related factors of children and adolescents were considered. After screening 12 studies, met the inclusion criteria, which were included in meta-analysis of this review. Selected articles and results of them were examined and synthesized in sub headings through thematic analysis. The findings of this systematic review were analyzed using Microsoft excel sheet.

Inclusion and exclusion criteria

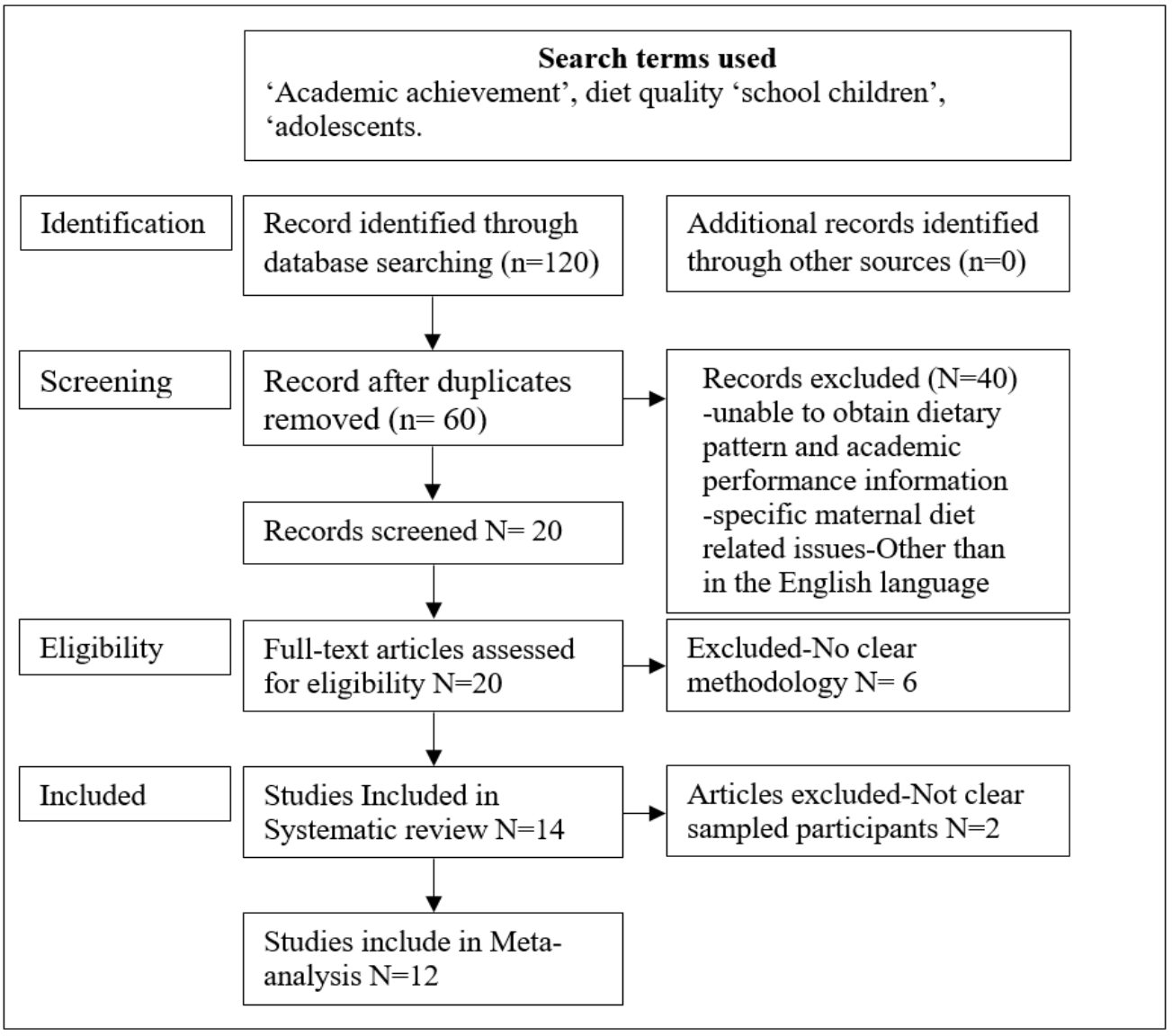
The studies published in English, focusing on academic performance and its influencing factors and employing a clear methodology were included. Similarly, if they lacked a clear methodology and sampled participants did not examine dietary patterns in relation with academic achievement, focused on maternal diet related issues, published in other than English language were excluded in this study.

DOI: 10.56580/GEOMEDI66

Selection process

A PRISMA flow diagram was used to illustrate the study selection process. First of all, a total 120 full-text articles were retrieved from electronic databases including scholar.google.com, Pubmed.com, eric.ed.gov, Elicit.com, sematicscholar.com. After removing duplicate records, 60 unique studies remained for screening. During the screening phase, 40 articles were removed based on title and abstract screening because they did not focus on academic performance. They were published in languages other than English, or contained content pertaining to maternal diet. During the eligibility phase, 20 full-text articles were assessed for methodological soundness and applicability. Six of these articles were rejected due to unclear methodology. Among the total, 14 studies that met the inclusion criteria were included in the systematic review. Two articles were excluded at the end because of not clear participants in samples. Finally, 12 articles met the inclusion criteria for meta-analysis. These studies were analyzed and categorized thematically based on the ways in which diet affects academic performance. The PRISMA flow diagram provides a visual representation of this methodical selection process, which are presented in Figure 1.

Figure: 1 *PRISMA Flow Diagram of the Study*



DOI: 10.56580/GEOMEDI66

Results

The available studies were examined to summarize academic achievement and its associated factors, which were energy intake, fruit and vegetable intake dietary patterns and overall diet in children and adolescents. The majority of the reviewed studies were cross-sectional which are presented in figure 2.

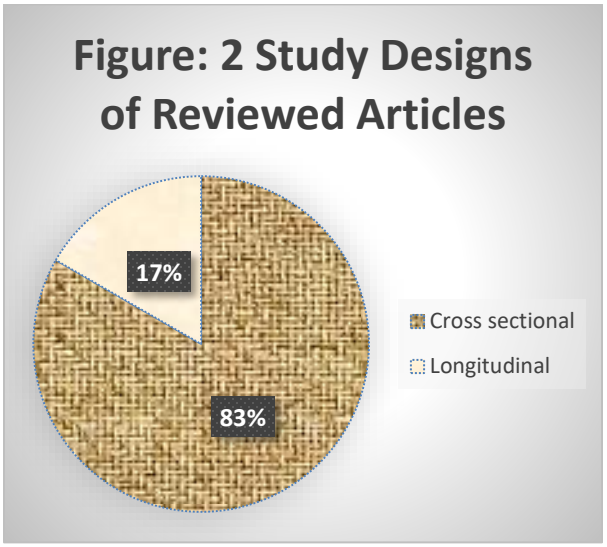


Figure 2 showed that out of total, 83.33% articles used cross-sectional design and 16.67% used longitudinal research design in this reviewed study.

It indicated the need of longitudinal studies to conform the findings, which have not been conducted sufficiently.

Similarly, the average age group was ranged 4-22 years in this systematic review and meta-analysis. Overall findings suggested a positive association between the frequency of good dietary intake and academic outcome.

The reviewed study revealed the different influencing factors of academic performance in children and adolescents which are presented in figure 3.

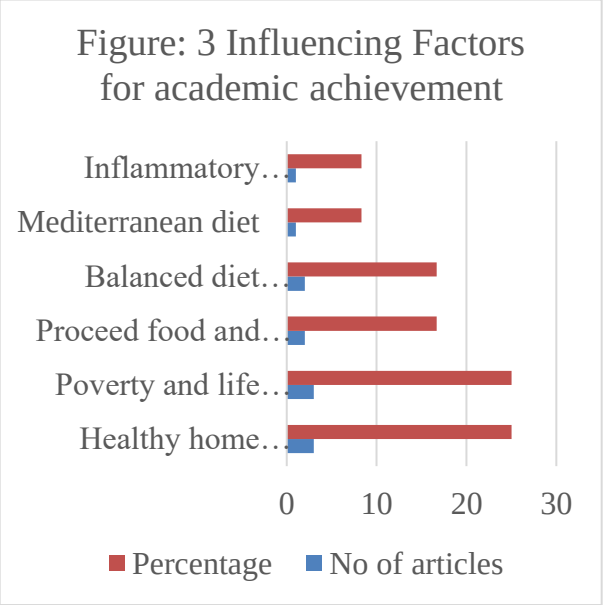


Figure 3 showed that most of the reviewed articles (25%) reported healthy home food environment and breakfast as a influencing factor for academic performance of children and adolescents, followed (25%) poverty and life style, 16.67% proceed food and energy dense diet, 16.67% balance diet with fruits and vegetables, 8.33% Mediterranean diet and 8.33% reported Inflammatory and anti-inflammatory diet.

Whereas, the healthy home food environment and taking breakfast appropriately, balanced diet with fruits and vegetables and anti-inflammatory diet were reported as the positive influencing factors and proceed food and energy dense diet, Inflammatory diet as well as poverty and sedentary life styles were reported as negative influencing factors for academic achievement of children and adolescents.

DOI: 10.56580/GEOMEDI66

Out of total reviewed articles, most of the articles (25%) reported healthy home food environment and breakfast as a positive influencing factor for academic performance. Regarding the negative influence, approximately 25% articles reported poverty and life styles as a negative influencing factor for academic achievement of children and adolescents.

Discussion

This meta-analysis identified the factors that influence academic performance of children and adolescents which are described here.

Dietary factors

This review revealed the different types of diet in relation to academic performance, which includes the inflammatory and anti-inflammatory died, proceed foods and energy dense diet, Mediterranean diet and balance diet.

Out of them, the inflammatory diet (white breads, cereals, white pasta, and other products made with refined flours as well as white rice) may negatively impact academic achievement and adhere to a more anti-inflammatory diet (fresh fruits and vegetables, fish, whole grains and fats) to achieve academic benefits of children and adolescents [9]. Contradictorily, in reference to proceed foods and energy dense diet, academic performance was not linked to a nutritious diet, and it was negatively correlated with an energy-dense nutrient-poor diet [1].

In this way, another study claimed that a high-fiber diet can improve the brain electrophysiology and cognitive function. The health and cognitive development of the students are significantly impacted by plant-based diets. Eating a processed diet might make learning more difficult in children and adolescents [10]. Similarly, the Mediterranean diet includes (vegetables and tubers, Fruits, Grains, Nuts, seeds and legumes) performed better than the low fruit and vegetables. In nutshell, the Med Diet was associated with improved cognitive and academic performance of children and adolescents ($p < 0.05$) [11]. Therefore, we can say that diet have sometimes negative effects too if we could not identify which food if good for learning and development.

Regarding the balanced diet with fruits and vegetables, the increased consumption of dark green and red-orange vegetables, beans and peas, potatoes and eggs were associated with a higher reading proficiency [12]. But unhealthy diets were associated with overweight and obesity, which are linked to decreased cognitive abilities and academic achievement in children and adolescents [7]. Although, a study reported that the dietary diversity score (DDS) of children had no direct, indirect, or total effect on his/her academic achievement [13]. This depicted that balanced diets have a significant value in developing learning achievement in students.

Healthy Home Food Environment and Breakfast

This study found that high academic achievers were more likely to have a favorable healthy home environment (HFE) score [14]. In this regard, healthy breakfast have a crucial role to better cognitive and academic performance of children. Regularly eating a healthy breakfast has a positive impact on motivation and learning of children and adolescents in the home and

DOI: 10.56580/GEOMEDI66

classroom [15]. Even a study resulted that 24.8% of students perform well in school, whereas 88.2% of students eat three times meals a day, and 88.9% of students eat breakfast regularly including consumption of fruits and vegetables [16]. It indicates that regular eating breakfast and healthy home food environment can improve academic achievement of children and adolescents.

Poverty and Life styles

This study identified the poverty and life styles as a influencing factor of academic performance. To support this finding a study reported that children living in poverty tend to perform poorly academically, which results in reduced educational attainment and significantly lower scores on standardized tests. Over the course of a lifetime, these patterns continue into adulthood and result in a decline in professional accomplishment [17]. Eating or dietary behaviors strongly correlate health status of children [18]. Similarly in life style, the children who maintained at least three healthy lifestyles such as not being overweight, limiting screen time, and getting enough sleep were more likely to be in the high-performance in classroom [19]. Even though, the food insecure children reported lower academic performance with prior campus-based studies [20]. Therefore, poverty and life styles have also a critical role to improve academic performance of children and adolescents.

Conclusion

The study concluded that the factors such as healthy home food environment and various balanced diet, fruits and vegetables have positive influences and proceed food, energy dense diet, Inflammatory diet, poverty and sedentary life styles have negative influences in academic achievement of children and adolescents. However, the more longitudinal studies are needed to conform the results of this reviewed article. Thus, standardized evaluation and reporting of academic results, comprehensive measures of the entire validated diet and other factors should all be taken into account in future research. Where rigorous design and control of biases as well as confounding variables are needed to conform these associations.

Abbreviations

DDS Dietary Diversity Score
HFE Healthy Home Food Environment
MED DIET Mediterranean Diet

Acknowledgments: We would like to thank all the participants for their active involvement during this study.

Author Contributions

Bishnu K. Adhikari: Conceptualization, data curation, investigation, methodology, project administration, software, validation, visualization, writing – original draft, writing – review and editing

Prakash Sharma: Conceptualization, formal analysis, project administration, resources, supervision, validation, visualization, writing - review and editing

1. ***Funding:*** *This study did not receive any funding.*

2. ***Conflicts of Interest:*** *The authors declare that no conflicts of interest.*

DOI: 10.56580/GEOMEDI66

ბავშვთა და მოზარდთა აკადემიურ მოსწრებაზე მოქმედი ფაქტორების სისტემატური მიმოხილვა და მეტაანალიზი

*ბიშნუ კ. ადჰიკარი[1], პრაკაშ შარმა (კორესპონდენტი ავტორი)[2]**

[1]ჯანმრთელობის, ფიზიკური და მოსახლეობის განათლების დეპარტამენტი, სანოთიმის კამპუსი, განათლების ფაკულტეტი, ტრიბჰუვანის უნივერსიტეტი, ბჰაკტაპური, ნეპალი

[2]განათლების დეპარტამენტი, ბუტვალის მრავალდარგობრივი კამპუსი, განათლების ფაკულტეტი, ტრიბჰუვანის უნივერსიტეტი, ბუტვალი, ნეპალი.

*ელფოსტა: prakasharma35@gmail.com

აბსტრაქტი

საზოგადოებრივი ჯანმრთელობის საკითხებისთვის, აკადემიური მოსწრება უმნიშვნელოვანესი ქვაკუთხედია, რადგან ის სასიცოცხლოდ მოქმედებს მომავალ წარმატებაზე. თუმცა, ბავშვებისა და მოზარდების აკადემიურ მოსწრებაზე მოქმედი ფაქტორები ჯერ კიდევ სათანადოდ არ არის შესწავლილი. მიზნები: მეტაანალიზის საშუალებით, ბავშვებსა და მოზარდებში აკადემიურ მოსწრებაზე მოქმედი ფაქტორების სისტემატური მიმოხილვის შედეგების სინთეზირება და კრიტიკული შეფასება. მეთოდები: სხვადასხვა მონაცემთა ბაზიდან, მეტაანალიზისთვის ჩატარდა მრავალფაქტორული ლიტერატურული მიმოხილვა. კვლევები ამოღებული იქნა scholar.google.com, pubmed.com, eric.ed.gov, elicit.com, sematicscholar.com-დან, რათა გამოვლენილიყო 2015-დან 2025 წლამდე გამოქვეყნებული დაკავშირებული კვლევები დიაგრამის PRISMA გამოყენებით. თავდაპირველად, გამოვლინდა დაახლოებით 120 სრული ტექსტის მქონე კვლევა. მათ შორის, არარელევანტური კვლევები გამოირიცხა. სკრინინგის შემდეგ, 12 კვლევა, რომლებიც შედიოდა აღნიშნული მიმოხილვის მეტაანალიზში, აკმაყოფილებდა ჩართვის ყველა კრიტერიუმს. შერჩეული კვლევები და მათი შედეგები შემოწმდა და სინთეზირდა ქვესათაურებში, თემატური ანალიზის საშუალებით. შედეგები: კვლევამ აჩვენა, რომ სტატიების 83.33%-ში გამოყენებული იყო ჯვარედინი კვლევის დიზაინი, ხოლო 16.67%-ში - გრძივი კვლევის დიზაინი. ჯანსაღი საშინაო გარემო და საუზმე, უმრავლესობაში (25%), აკადემიური მოსწრების გავლენის ფაქტორებად იქნა მიჩნეული, შემდეგ მოდის სიღარიბე და უმოძრაო ცხოვრების წესი, მაღალი ენერგეტიკული ღირებულება, დაბალანსებული დიეტა, ხილი და ბოსტნეული, ხმელთაშუა ზღვის დიეტა, ანთებითი და ანთების საწინააღმდეგო დიეტა (25%, 16.67%, 16.67%). შესაბამისად, 8.33% და 8.33% ბავშვებისა და მოზარდების აკადემიური მოსწრების გავლენის ფაქტორებად. დასკვნა: კვლევამ დაასკვნა, რომ ბავშვებისა და მოზარდების აკადემიურ მოსწრებაზე გავლენას ახდენს სხვადასხვა ფაქტორი. ძირითადად, კვების რაციონი, საშინაო გარემო და საუზმე, ასევე სიღარიბე და ცხოვრების წესი. მიუხედავად ამისა, ამ კავშირის დასადასტურებლად, აუცილებელია, მკაცრი დიზაინი, ცრურწმენების და შემაშრიალებელი ცვლადების კონტროლი.

DOI: 10.56580/GEOMEDI66

საკვანძო სიტყვები: აკადემიური მოსწრება, გავლენის ფაქტორი, ბავშვები და მოზარდები.

References

1. Pearce K, Golley R, Lewis L, Cassidy L, Olds T, Maher C. The apples of academic performance: associations between dietary patterns and academic performance in Australian children. Journal of School Health. 2018;88(6):444-52. https://doi.org/10.1111/josh.12631

2. Bücker S, Nuraydin S, Simonsmeier BA, Schneider M, Luhmann M. Subjective well-being and academic achievement: A meta-analysis. Journal of Research in Personality. 2018;74:83-94. https://doi.org/10.1016/j.jrp.2018.02.007

3. York TT, Gibson C, Rankin S. Defining and measuring academic success. Practical assessment, research & evaluation. 2015;20(5):n5. https://files.eric.ed.gov/fulltext/EJ1059739.pdf

4. Peng P, Kievit RA. The development of academic achievement and cognitive abilities: A bidirectional perspective. Child development perspectives. 2020; 14(1): 15-20. https://doi.org/10.1111/cdep.12352

5. Nyaradi A, Li J, Hickling S, Foster J, Oddy WH. The role of nutrition in children's neurocognitive development, from pregnancy through childhood. Frontiers in human neuroscience. 2013; 7: 97. https://doi.org/10.3389/fnhum.2013.00097

6. Adhikari BK, Sharma P, Giri S. The Paradox of Health Literacy: Unchanged Nutritional Behaviors of Literates. International Journal. 2025;14(2):117-24. https://doi.org/10.11648/j.ijnfs.20251402.14

7. Naveed S, Lakka T, Haapala EA. An overview on the associations between health behaviors and brain health in children and adolescents with special reference to diet quality. International Journal of Environmental Research and Public Health. 2020;17(3):953. https://doi.org/10.3390/ijerph17030953

8. Burrows T, Goldman S, Pursey K, Lim R. Is there an association between dietary intake and academic achievement: a systematic review. Journal of Human Nutrition and Dietetics. 2017; 30(2): 117-40. https://doi.org/10.1111/jhn.12407

9. Esteban-Cornejo I, Mota J, Abreu S, Pizarro AN, Santos MP. Dietary inflammatory index and academic performance in children. Public health nutrition. 2018;21(17):3253-7. https://doi.org/doi:10.1017/S1368980018001994

10. Mualem R, Jadon N, Shance S, Hussein Farraj R, Mansour R, Cohen S. The effect of dietary preferences on academic performance among kindergarten-aged children. J Neurosci Neurol Surg. 2023;13:277. https://doi.org/10.31579/2578-8868/277

11. Peña-Jorquera H, Martínez-Flores R, Espinoza-Puelles JP, López-Gil JF, Ferrari G, Zapata-Lamana R, et al. Adolescents with a favorable Mediterranean-style-based pattern show higher cognitive and academic achievement: a cluster analysis—the cogni-action project. Nutrients. 2024;16(5):608. https://doi.org/10.3390/nu16050608

12. Barg G, Frndak S, Queirolo EI, Peregalli F, Kordas K. Dietary patterns and cognitive achievement among school children in socio-

cultural context, a case of Montevideo, Uruguay. European journal of nutrition. 2023;62(6):2475-88. https://doi.org/10.1007/s00394-023-03167-z.

13. Beressa G, Biratu A, Lencha B, Sahiledengle B, Zenbaba D, Bekele D, et al. Association between dietary diversity, nutritional status, and academic performance of school-age children in Southeast Ethiopia using structural equation modelling. Journal of Health, Population and Nutrition. 2024;43(1):188. https://doi.org/10.1186/s41043-024-00687-0

14. Sohail R, Hasan H, Saqan R, Barakji A, Khan A, Sadiq F, et al. The Influence of the Home Food Environment on the Eating Behaviors, Family Meals, and Academic Achievement of Adolescents in Schools in the UAE. International Journal of Environmental Research and Public Health. 2024;21(9):1187. https://doi.org/10.3390/ijerph21091187

15. Martin AJ, Bostwick KC, Burns EC, Munro-Smith V, George T, Kennett R, et al. A healthy breakfast each and every day is important for students' motivation and achievement. Journal of School Psychology. 2024;104:101298.

16. Rajan Jr A, Peter RM, Logaraj M, Palanivel SM, Anantharaman V. Relation of Dietary Practices and Academic Achievement Among School-Going Children in Kattankulathur Block, Chengalpattu District, Tamil Nadu. Cureus. 2024; 16(11). https://doi.org/10.1016/j.jsp.2024.101298

17. Hair NL, Hanson JL, Wolfe BL, Pollak SD. Association of child poverty, brain development, and academic achievement. JAMA pediatrics. 2015; 169(9): 822-9. https://doi.org/10.1001/jamapediatrics.2015.1475.

18. Adhikari BK, Giri S, Sharma P. Evaluation of Childhood Dietary Patterns and Their Impact on Nutrition Status: A Literature Review. International Journal of Nutrition and Food Sciences. 2024;13(3):66-76. https://doi.org/10.11648/j.ijnfs.20241303.12

19. Adelantado-Renau M, Jiménez-Pavón D, Beltran-Valls MR, Moliner-Urdiales D. Independent and combined influence of healthy lifestyle factors on academic performance in adolescents: DADOS Study. Pediatric Research. 2019;85(4):456-62. https://doi.org/10.1038/s41390-019-0285-z

20. Payne-Sturges DC, Tjaden A, Caldeira KM, Vincent KB, Arria AM. Student hunger on campus: Food insecurity among college students and implications for academic institutions. American Journal of Health Promotion. 2018; 32(2): 349-54. https://doi.org/10.1177/0890117117719620.