Journal homepage: **https://medicinskiglasnik.ba**

Med Glas (Zenica) 2024;21(2)
https://doi.org/10.17392/1746-21-02

Med Glas (Zenica)

ORIGINAL ARTICLE

The correlation between nutritional status and diet quality with acute respiratory infections in preschool children aged 5 to 7 years

Melika Melunović[1*], Belma Krdžalić-Zečević[2], Mirela Lisičić-Konaković[3], Amela Kulašević[3], Lejla Kurtalić[4]

[1]Paediatrics Department, Novo Sarajevo Health Centre, [2]Paediatrics Department, Centre Health Centre, [3]Paediatrics Department, Ilidža Health Centre, [4]Department of Family Medicine, Novi Grad Health Centre; The Public Institution Health Centre of Sarajevo Canton, Sarajevo, Bosnia and Herzegovina

ABSTRACT

Aim To investigate the relationship between nutritional status (NS) and diet quality (DQ) with the frequency of acute respiratory infections (ARIs) in children aged 5 to 7 years.

Methods Data were obtained through questionnaires. Anthropometric measurement, correlations between body mass index (BMI) and DQ with frequency of ARIs were analysed.

Results A total of 129 children with an average age of 72.2±4.2 months were examined. Malnourished children had a 3.4 times higher probability of ARIs (OR=3.449; p=0.025, 95% CI=0.109-29.049) and a 5.6 times higher probability of bronchopneumonia compared to those with normal weight (OR=5.643; p=0.049, 95% CI=0.874-36.434). There was a significant positive association between the consumption of meat and meat products with bronchitis (p=0.030; OR 9.921; 95% CI -1.252, +78.610) and a significant negative relationship between the consumption of cooked meals and ARIs in total (p=0.015; OR 0.046; 95% CI -0.004, +0.552). Unexpectedly, a significant positive association was found between the consumption of fresh fruits and vegetables and some respiratory infections, which needs to be verified with additional analyses.

Conclusion DQ and NS are associated with the frequency of ARIs in preschool children. Additional analyses are needed with a larger number of participants in order to form more precise conclusions.

Keywords: child, diet, nutritional status, preschool, respiratory tract infections

INTRODUCTION

Acute respiratory infections (ARIs) are a common cause of referral to a general practitioner in both adults and children resulting in a large number of prescribed medications, including antibiotics (1). The quality of life of children with recurrent respiratory infections is significantly worsened compared to children without them (2).

A significant risk factor for ARIs is nutritional status (NS) and diet quality (DQ). Undernutrition and obesity are associated with increased susceptibility to infections in both children and adults (3). Also, both undernutrition (4,5) and obesity (6,7) can be associated with frequent ARIs. It has been proven that certain micronutrients, such as vitamins C, D, A, E, B6, B12, folate, omega-3 fatty acids, iron, zinc, copper, and selenium have an impact on adequate functioning of the immune system (8–11), so it is important that these substances are taken into the body in adequate amounts.

The relation of intake of some food groups and particular food with respiratory infections was also examined. An increase of fruit and vegetable consumption has a negative relationship with the incidence of respiratory

*** Corresponding author:** Melika Melunović
Paediatrics Department, Novo Sarajevo Health Centre, The Public Institution Health Centre of Sarajevo Canton
Paromlinska 53e, 71000, Sarajevo, Bosnia and Herzegovina
Phone: +387 033 704 804
E-mail: melika_dozic@yahoo.com
ORCID: https://orcid.org/0000-0003-1344-9221

 | Submitted: 11. Mar. 2024. Revised: 02 Apr. 2024. Accepted: 13 Jun. 2024.

infections (12,13). The consumption of coffee, tea, oily fish also has the same effect (12). Regular consumption of green vegetables, beef, whole milk, full-fat butter according to the recommendation can reduce the number of days with symptoms of an upper respiratory tract infections (URTIs); consequently, the use of antibiotics was significantly reduced as well as visits to a general practitioner, thereby possibly reducing healthcare costs. The number of infections was also smaller, but not significantly reduced (14).

On the other hand, increased consumption of red meat is associated with an increased frequency of pneumonia (12). Fast food diet, through increased intake of sugar, salt, fat and consequently higher intake of calories and macronutrients, may lead to intensified inflammation and to reduced control of infection (15).

Colostrum and breast milk contain many bioactive factors that the child receives during breastfeeding, which supports the immune system and protects against infections (16). According to some studies breastfeeding is inversely associated with ARIs (17,18).

In Bosnia and Herzegovina (B&H) there are no published studies on the connection between NS and DQ with ARIs in preschool children.

The aim of our research was to examine the correlation of NS with ARIs in children aged 5 to 7 years and to investigate whether the quality of diet affects the frequency of ARIs in this age group in Sarajevo Canton.

PATIENTS AND METHODS

This observational, cross-sectional study was conducted in The Public Institution Health Centre of Sarajevo Canton, Bosnia and Herzegovina, during the period between June and September 2022.

A total of 129 patients who met the specified criteria were included. Inclusion criteria comprised preschool children aged 5 to 7 years, receiving treatment at Primary Health Centres in Sarajevo Canton, with parents or legal guardians consenting to their participation in the research. Exclusion criteria were children with pre-existing diseases or conditions that may influence their nutritional status or frequent occurrence of respiratory infections (congenital anomalies and syndromes, chronic diseases of gastrointestinal and respiratory tract and other chronic diseases). Boys and girls were equally represented.

They were classified according to body mass index (BMI) values (19) in three groups considering a gender and age: the first group included undernourished children (BMI <5th percentile), the second group included normally nourished children (BMI 5th to <85th percentile) and in the third group were overweight (BMI 85th to <95th percentile) and obese children (BMI ≥95th percentile). The study was conducted in accordance with the principles of the Declaration of Helsinki and was approved by the Ethics Committee of Public Institution Health Centres of Sarajevo Canton. Parents or legal guardians, after receiving information about the content, purpose and course of research, possible inconveniences and the possibility of voluntary withdrawal from research, gave their consent for the inclusion of their child in research.

Methods

Anthropometric parameters, body weight and body height were measured, and the BMI was calculated as children's weight in kilograms divided by the square of height in meters. Standardized methods were used for measuring body weight and body height (20). The height was measured using vertical stat meter, the values were expressed in centimetres (cm) and rounded at 0.5 cm. Body weight was measured using digital balance, the values were expressed in kilograms (kg) and rounded at 0.1 kg. For comparison growth charts for BMI of the Centre for Disease Control and Prevention CDC (19) criteria were used.

Data about frequency of ARIs and DQ were collected from the respondents' parents or legal guardians through a questionnaire that was made for the purpose of the study, modified according to questionnaires used in similar published studies of relevant centres (21–26). The frequency of certain upper respiratory tract infections (URTIs) (cold, rhinitis, sinusitis, tonsillopharyngitis, otitis, laryngitis) and lower respiratory tract infections (LRTIs) (bronchitis, bronchopneumonia) during the last year were categorized as "not once", "once to two times", "three or more times" according to answers.

For breastfed children, information was gathered regarding the duration of breastfeeding, with responses categorized as "one to six months", "seven to twelve months", and "thirteen months or more".

To analyse diet quality, data were collected on the number of main meals and snacks consumed during the day over the past year, with responses categorized as "none," "one," "two," or "three or more." Recognizing variations in meal schedules between weekdays and weekends, the number of main meals and snacks during these periods were analysed separately. The frequency of consumption of specific food groups (fresh fruits and vegetables, milk and dairy products, meat and meat products, cooked dishes, fried dishes, fast food, snacks and sweets, sweetened juices) over the past year were categorized as "not at all", "sometimes", or "almost daily/every day" according to answers. Subsequently, the relationship between NS and DQ with ARIs were explored.

Statistical analysis

Descriptive statistics was utilized to summarize the basic characteristics of the study group. Data for number and age of participants, BMI, number of ARIs, breastfeeding, number of main meals and snacks, and frequency of consumption of certain food groups included rates and percentages, median, minimum, maximum. Spearman's rank correlation coefficient was used to assess the correlation between the probability of ARIs in

relation to breastfeeding. Logistic regression univariate analysis was used to analyse impact of NS on ARIs and logistic regression multivariate analysis was used to analyse impact of DQ on the ARIs (odds ratio, OR; CI 95%, confidence interval 95%). A $p<0.05$ was considered statistically significant.

RESULTS

Out of the total of 129 children aged 5-7 years, the mean±standard deviation (SD) of age was 7.22±4.2 months. There was a slightly higher number of boys compared to girls, 65 (50.4%) and 64 (49.6%), respectively.

The average BMI was 15.9±2.3 kg/m^2 with the lowest recorded value of 11.9 kg/m2 and the highest of 23.8 kg/m^2. The largest number of children was in the category of normally nourished, 83 (64.3%), 37 (28.7%) were overweight or obese, and nine (7.0%) were malnourished. URTIs were more common than LRTIs. Malnourished children had a 3.4 times higher probability of ARIs compared to normally nourished children (OR=3.449; p=0.025, 95%CI=0.109-29.049) and 5.6 times higher probability to develop bronchopneumonia compared to those with normal weight (OR=5.643; p=0.049, 95%CI=0.874-36.434). No significant correlation was found between obesity and ARIs. Of the 129 respondents, a total of 111 (86.0%) were breastfed, of which most were breastfed for 1 to 6 months, 37 (33.3%). No statistically significant association between breastfeeding or duration of breastfeeding and ARIs was proven.

The number of main meals during weekdays was as follows: one at 1 (0.8%), two at 30 (23.3%) and three at 98 (76.0%), and during the weekend: one at 1 (0.8%), two at 35 (27.1 %) and three in 93 (72.1%) respondents. The number of snacks during weekdays was as follows: none at 7 (5.4%), one at 35 (27.1%), two at 73 (56.6%) and three at 14 (10.9%), and during the weekend: none at 8 (6.2%), one at 40 (31.0%), two at 62 (48.1%) and three at 19 (14.7%) respondents (Table 1).

The results showed a significant correlation between the number of main meals during the day and bronchitis and LRTIs, with a higher number of main meals during working days being associated with a higher number of bronchitis (p=0.015; OR 112.768; 95% CI -2.461, +5167.209) and LRTIs, while a higher number of main meals during weekend days was associated with a lower number of bronchitis (p 0.014; OR 0.025; 95% CI -0.001, + 0.469) and fewer LRTIs. A significant positive association of fresh fruit and vegetable consumption with rhinitis (p 0.016; OR 5.131;95% CI -1.362, + 19.324), tonsillopharyngitis (p 0.047; OR 4.532; 95% CI - 1.017, + 20.188), URTIs and ARIs in total was found. Consumption of meat and meat products showed a significant positive association with bronchitis (p 0.030; OR 9.921; 95% CI - 1.252, + 78.610). Consumption of cooked meals had a significant negative relationship with ARIs.

Table 1. Consumption frequency for certain food groups

Type of food	Frequency of consumption	No (%) of children
Fresh fruits and vegetables	Never	2 (1.6)
	Sometimes	20 (15.5)
	Almost daily or daily	107 (82.9)
Milk and dairy products	Never	2 (1.6)
	Sometimes	24 (18.6)
	Almost daily or daily	103 (79.8)
Meat and meat products	Never	0 (0.0)
	Sometimes	41 (31.8)
	Almost daily or daily	88 (68.2)
A cooked dish	Never	0 (0.0)
	Sometimes	23 (17.8)
	Almost daily or daily	106 (82.2)
Fried dish	Never	7 (5.4)
	Sometimes	108 (83.7)
	Almost daily or daily	14 (10.9)
Fast food	Never	7 (5.4)
	Sometimes	122 (94.6)
	Almost daily or daily	0 (0.0)
Snacks and sweets	Never	2 (1.6)
	Sometimes	82 (63.6)
	Almost daily or daily	45 (34.9)
Sweetened juices	Never	28 (21.7)
	Sometimes	91 (70.5)
	Almost daily or daily	10 (7.8)

No other significant relationships were found by multivariate logistic regression analysis between DQ and ARIs (Table 2).

DISCUSSION

In this study, the relationship between NS and DQ was examined, incorporating a detailed analysis of meal schedule and the consumption of specific food groups, in association with the frequency of ARIs among preschool children.

The data revealed a significant impact of malnutrition on the prevalence of respiratory infections. Malnourished patients demonstrated a 3.4-fold higher likelihood of experiencing respiratory infections and were 5.6 times more susceptible to bronchopneumonia compared to those with normal nutritional status. Similarly, AboElfotoh et al. reported a positive correlation between a child's nutritional status and the occurrence of acute LRTIs. Moreover, improvements in children's nutritional status were associated with a notable decrease in both mortality and morbidity resulting from respiratory tract infections (4).

In contrast to our findings, where obese children did not exhibit an elevated propensity for ARIs, a previous study had demonstrated twofold increased risk of ARIs in children who were overweight (6). Similarly, it was reported that overweight or obese children aged 10 years face a heightened risk of respiratory symptoms and diseases (27).

Table 2. Logistic regression analysis: relationship between diet quality and acute respiratory infections (ARIs)

Type of food	OR (CI 95% min.-max.)					
	URTIs	p	LRTIs	p	ARIs in total	p
Main meals - weekday	3.657 (0.468-28.543)	0.216	69.050 (2.442-1952.608)	0.013	4.343 (0.465-40.594)	0.198
Snacks - weekday	0.832 (0.223-3.099)	0.784	0.558 (0.126-2.476)	0.443	0.558 (0.130-2.387)	0.431
Main meals – weekend	0.508 (0.066-3.909)	0.515	0.043 (0.003-0.617)	0.021	0.279 (0.029-2.661)	0.267
Snacks - weekend	1.582 (0.506-4.945)	0.430	1.134 (0.282-4.551)	0.859	1.599 (0.492-5.197)	0.435
Fresh fruits and vegetables	4.592 (1.024-20.605)	0.047	1.108 (0.200-6.132)	0.906	5.806 (1.217-27.707)	0.027
Milk and dairy products	0.965 (0.282-3.300)	0.955	0.490 (0.098-2.455)	0.386	0.704 (0.191-2.590)	0.597
Meat and meat products	2.297 (0.525-10.045)	0.269	4.038 (0.692-23.571)	0.121	2.875 (0.590-14.019)	0.191
Cooked dishes	0.134 (0.017-1.039)	0.054	1.197 (0.221-6.493)	0.835	0.046 (0.004-0.552)	0.015
Fried dishes	0.450 (0.080-2.523)	0.364	0.251 (0.034-1.835)	0.173	0.386 (0.064-2.322)	0.298
Fast food	1.557 (0.155-15.639)	0.707	519264699.213 (0.000-.)	0.999	1.633 (0.165-16.148)	0.675
Snacks and sweets	0.777 (0.228-2.655)	0.688	2.492 (0.528-11,758)	0.249	0.640 (0.183-2.236)	0.484
Sweetened juices	1.444 (0.520-4.006)	0.481	0.732 (0.181-2.960)	0.662	1.887 (0.640-5.568)	0.250

OR, odds ratio; CI 95%, 95% confidence interval; min., minimum; max., maximum; URTIs, upper respiratory tract infections; LRTIs, lower respiratory tract infections; ARIs, acute respiratory infections

Our research did not find an association between breastfeeding or the duration of breastfeeding with the frequency of ARIs. In contrast to our research, other authors proved the association of breastfeeding and duration of breastfeeding with a lower frequency of respiratory infections (21,28,29) and protection against respiratory infections in the period after the cessation of breastfeeding (22).

Due to the busy lifestyle of both parents and children, meal skipping is common, potentially leading to inadequate nutritional intake. Meal frequency affects cytokine production by peripheral blood mononuclear cells (23). Our results showed a significant correlation between the number of main meals during the day and bronchitis and LRTIs, with a higher number of main meals during working days and lower number of main meals during weekend days being associated with a higher number of bronchitis and LRTIs. We have not found any other study that has analysed the relationship between the frequency of meals per day and respiratory infections. The disparity in the impact of the number of main meals consumed on weekdays versus weekend days in relation to respiratory infections remains unclear. It is conceivable that the data provided by parents may be imprecise, as children often consume a portion of their meals during weekdays at kindergartens.

There are numerous benefits of consuming fruits and vegetables with also a positive impact on protection against respiratory infections. Citrus fruits are associated with anticancer, antiviral, anti-microbial and anti-inflammatory activities (30). Garlic has also antimicrobial effects (31). Foods originating from plants contain significantly more antioxidants than non-plant foods (32). Unexpectedly, our research results revealed overall a higher frequency of rhinitis, tonsillopharyngitis, URTIs, and ARIs associated with a greater number of fruit and vegetable meals. In contrast to our findings, other researchers have reported an inverse correlation between the consumption of fruits and vegetables and the prevalence of respiratory infections (12,33,34).

A similar unexpected observation was obtained by Peltonen et al. that the prevalence of common cold was lower in moderate and high adherence to the sweets-and-treats food pattern and higher in high adherence to the health-conscious food pattern suggesting that it could be the result of parents who were most health-conscious of their children's diet might also have been more aware of their children's illness (24). Our results showed that parents who are more concerned about children's health and give their children more fruits and vegetables to eat, probably visit paediatricians more often for infections in children.

Other groups of foods can also have an impact on the nutritional status, as well as on the immunity and defence capabilities of the body, and thus on the frequency of respiratory infections (12–14,25,26,33). Recent study from BiH has shown increased consumption of sweet and salty snacks among preschool and school children (35).

The consumption of milk and dairy products has a positive effect on reducing respiratory infections (14). These results were not proven in our research. Analysing the connection between the consumption of some other types of food with the frequency of respiratory infections, obtained results linked more frequent consumption of meat and meat products with more frequent bronchitis. Also, the consumption of cooked meals had a significantly negative relationship with ARIs in total. There were no other significant results. An increase in the consumption

of red meat is associated with an increased frequency of pneumonia (12), but changing the diet towards beef might reduce the number of days with URTIs, and consequently the use of antibiotics was also significantly reduced (14). Frequent consumption of processed foods, high-sugar foods and meat-heavy diet with fewer vegetables had a positive correlation with recurrent respiratory infections, but the intake of juice or carbonated beverages, chocolate, fried foods, western fast food, and puffed foods was not (33). An increased risk of pneumococcal carriage has been recorded with a high consumption of sweet pastries and jam (13). "Western" diet may increase the risk of frequent respiratory symptoms in children, but to some extent this association was explained by energy intake (25). Also, regular consumption of processed foods is associated with wheeze, hay fever and bronchitis among 10-year-old children (26).

Our research has several strengths. We have meticulously gathered detailed data on individual ARIs, the level of granularity not previously explored in this manner. Additionally, we conducted comparisons between the frequency of ARIs and variables, such as daily meal count and consumption of cooked meals, which have not been previously analysed.

However, this study also has notable weaknesses. The sample size is limited, which may affect the generalizability of our findings. Moreover, we did not collect quantitative data on food consumption, which could potentially lead to discrepancies with existing research.

In conclusion, we have proven some previously known facts, such as the connection between malnutrition and ARIs and the influence of the DQ on ARIs, as well as the consumption of cooked meals being associated with a lower number of LRTIs, which is significant considering the method of thermal processing of food. Diet quality and nutritional status exhibit associations with the frequency of acute respiratory infections in preschool children. To mitigate the occurrence of frequent acute respiratory infections, interventions should address both the content and preparation methods of children's meals, as well as the frequency of their consumption. Preference for boiled food over fried alternatives is recommended. Children's nutritional status should also be regularly monitored and all efforts should be made to correct deviations from normal. It is imperative to educate parents on the importance of healthy nutrition for children and to implement healthy eating principles within kindergarten settings. Additionally, further analyses with a larger participant pool are warranted to provide more detailed instructions and conclusions.

FUNDING

No specific funding was received for this study.

TRANSPARENCY DECLARATION

Conflict of interests: None to declare.

REFERENCES

1 Meier GC, Watkins J, McEwan P, Pockett RD. Resource use and direct medical costs of acute respiratory illness in the UK based on linked primary and secondary care records from 2001 to 2009. PloS One 2020;15;(8):e0236472. doi: 10.1371/journal.pone.0236472.

2 Jiang X, Sun L, Wang B, Yang X, Shang L, Zhang Y. Health-related quality of life among children with recurrent respiratory tract infections in Xi'an, China. PloS One 2013;8;(2):e56945. doi: 10.1371/journal.pone.0056945.

3 Dobner J, Kaser S. Body mass index and the risk of infection - from underweight to obesity. Clin Microbiol Infect Off Publ Eur Soc Clin Microbiol Infect Dis 2018;24;(1):24–8. doi: 10.1016/j.cmi.2017.02.013.

4 AboElfotoh MN, Rasheed EM, Sharaf SM, Tohamy NAB. Evaluation of Nutritional Status of Children with Acute Lower Respiratory Tract Infection. Egypt J Hosp Med 2020;79;(1):532–7. doi: 10.21608/ejhm.2020.85233.

5 Tupasi TE, Mangubat NV, Sunico ME, Magdangal DM, Navarro EE, Leonor ZA, et al. Malnutrition and acute respiratory tract infections in Filipino children. Rev Infect Dis 1990;12 Suppl 8:S1047-1054. doi: 10.1093/clinids/12.supplement_8.s1047.

6 Jedrychowski W, Maugeri U, Flak E, Mroz E, Bianchi I. Predisposition to acute respiratory infections among overweight preadolescent children: an epidemiologic study in Poland. Public Health 1998;112;(3):189–95. doi: 10.1038/sj.ph.1900438.

7 Karunanayake CP, Rennie DC, Ramsden VR, Fenton M, Kirychuk S, Lawson JA, et al. Bronchitis and Its Associated Risk Factors in First Nations Children. Child Basel Switz 2017;4;(12):103. doi: 10.3390/children4120103.

8 Hemilä H, Chalker E. Vitamin C reduces the severity of common colds: a meta-analysis. BMC Public Health 2023;23;(1):2468. doi: 10.1186/s12889-023-17229-8.

9 Maywald M, Wessels I, Rink L. Zinc Signals and Immunity. Int J Mol Sci 2017;18;(10):2222. doi: 10.3390/ijms18102222.

10 Gombart AF, Pierre A, Maggini S. A Review of Micronutrients and the Immune System-Working in Harmony to Reduce the Risk of Infection. Nutrients 2020;12;(1):236. doi: 10.3390/nu12010236.

11 Pecora F, Persico F, Argentiero A, Neglia C, Esposito S. The Role of Micronutrients in Support of the Immune Response against Viral Infections. Nutrients 2020;12;(10):3198. doi:10.3390/nu12103198.

12 Vu T-HT, Van Horn L, Achenbach CJ, Rydland KJ, Cornelis MC. Diet and Respiratory Infections:

Specific or Generalized Associations? Nutrients 2022;14;(6):1195. doi: 10.3390/nu14061195.
13 Tapiainen T, Paalanne N, Arkkola T, Renko M, Pokka T, Kaijalainen T, et al. Diet as a risk factor for pneumococcal carriage and otitis media: a cross-sectional study among children in day care centers. PloS One 2014;9;(3):e90585. doi: 10.13 71/journal.pone.0090585.
14 van der Gaag E, Brandsema R, Nobbenhuis R, van der Palen J, Hummel T. Influence of Dietary Advice Including Green Vegetables, Beef, and Whole Dairy Products on Recurrent Upper Respiratory Tract Infections in Children: A Randomized Controlled Trial. Nutrients 2020;12;(1):272. doi: 10.33 90/nu12010272.
15 Myles IA. Fast food fever: reviewing the impacts of the Western diet on immunity. Nutr J 2014;13:61. doi: 10.1186/1475-2891-13-61.
16 Palmeira P, Carneiro-Sampaio M. Immunology of breast milk. Rev Assoc Medica Bras 1992 2016;62;(6):584–93. doi: 10.1590/1806-9282.62. 06.584.
17 Vinod A, Kaimal RS. Study on acute respiratory infection in children aged 1 year to 5 years-A hospital-based cross-sectional study. J Fam Med Prim Care 2023;12;(4):666–71. doi: 10.4103/jfmpc.jfm pc_1748_22.
18 Lessa SM, Tietzmann DC, Amantéa SL. Factors associated with respiratory morbidity in the first year of life. J Pediatr (Rio J) 2023;99;(6):635–40. doi: 10.1016/j.jped.2023.05.007.
19 Centers for Disease Control and Prevention. Clinical growth charts . 1. [Online] https://www.cdc.gov/growthCharts/Clinical_Charts.htm National Center for. Health Statistics. Last Reviewed: 2017, June 16.
20 Barić I, Bralić I, Bituh M, Vranešić Bender D, Ćuk M, Herceg Čavrak V, et al. Prehrana u općoj i kliničkoj pedijatriji. Medicinska naklada; 2017.
21 Duijts L, Jaddoe VWV, Hofman A, Moll HA. Prolonged and exclusive breastfeeding reduces the risk of infectious diseases in infancy. Pediatrics 2010; 126;(1):e18-25. doi: 10.1542/peds.2008-3256.
22 Tromp I, Kiefte-de Jong J, Raat H, Jaddoe V, Franco O, Hofman A, et al. Breastfeeding and the risk of respiratory tract infections after infancy: The Generation R Study. PloS One 2017;12;(2): e0172763. doi: 10.1371/journal.pone.0172763.
23 Dixit VD, Yang H, Sayeed KS, Stote KS, Rumpler WV, Baer DJ, et al. Controlled meal frequency without caloric restriction alters peripheral blood mononuclear cell cytokine production. J Inflamm Lond Engl 2011;8:6. doi: 10.1186/1476-9255-8-6.
24 Peltonen H, Erkkola M, Abdollahi AM, Leppänen MH, Roos E, Sajaniemi N, et al. Associations of dietary patterns with common infections and antibiotic use among Finnish preschoolers. Food Nutr Res 2023;67. doi: 10.29219/fnr.v67.8997.
25 Tromp IIM, Kiefte-de Jong JC, de Vries JH, Jaddoe VWV, Raat H, Hofman A, et al. Dietary patterns and respiratory symptoms in pre-school children: the Generation R Study. Eur Respir J 2012;40; (3):681–9. doi: 10.1183/09031936.00119111.
26 Wright CY, Nkosi V, Wichmann J. Respiratory Health Symptoms among Schoolchildren in Relation to Possible Food-Related Risk and Protective Factors. Int J Environ Res Public Health 2018; 15;(3):502. doi: 10.3390/ijerph15030502.
27 He Q, Wong T, Du L, Jiang Z, Qiu H, Gao Y, et al. Respiratory health in overweight and obese Chinese children. Pediatr Pulmonol 2009;44;(10):997–1002. doi: 10.1002/ppul.21091.
28 Tarrant M, Kwok M-K, Lam T-H, Leung GM, Schooling CM. Breast-feeding and childhood hospitalizations for infections. Epidemiol Camb Mass 2010;21;(6):847–54. doi: 10.1097/EDE.0b013e318 1f55803.
29 Chantry CJ, Howard CR, Auinger P. Full breastfeeding duration and associated decrease in respiratory tract infection in US children. Pediatrics 2006; 117;(2):425–32. doi: 10.1542/peds.2004-2283.
30 Alexander I. Exploitative Beneficial Effects of Citrus Fruits. In: Sajid M, Amanullah, editors. Citrus - Health Benefits Prod. Technol., IntechOpen; 2019. doi: 10.5772/intechopen.79783.
31 Bayan L, Koulivand PH, Gorji A. Garlic: a review of potential therapeutic effects. Avicenna J Phytomedicine 2014;4;(1):1–14.
32 Carlsen MH, Halvorsen BL, Holte K, Bøhn SK, Dragland S, Sampson L, et al. The total antioxidant content of more than 3100 foods, beverages, spices, herbs and supplements used worldwide. Nutr J 2010;9:3. doi :10.1186/1475-2891-9-3.
33 Zhang W, Yu H, Shang J, Liu T, Ma J, Gu X. Association between dietary habits and recurrent respiratory infection in children: A case–control study. J Tradit Chin Med Sci 2015;2;(2):105–10. doi: 10.1016/j.jtcms.2016.01.003.
34 Ten Velde LGH, Leegsma J, Van Der Gaag EJ. Recurrent Upper Respiratory Tract Infections in Children;The Influence of Green Vegetables, Beef, Whole Milk and Butter. Food Nutr Sci 2013;04; (10):71–7. doi: 10.4236/fns.2013.410A011.
35 Lisičić-Konaković M, Mesihović-Dinarević S, Bajrić E, Jurišić S, Musa Trolić I, Ćubela M, et al. Frequency of sweet and salty snack consumption among children in relation to their mothers' education level. Med Glas 2023;20;(2). doi: 10.17392/16 18-23.