

Lifestyle of elementary school children (6-9 years) with functional constipation during Covid-19 pandemic in Surabaya

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Lifestyle of elementary school children (6-9 years) with functional constipation during Covid-19 pandemic in Surabaya

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5

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ABSTRACT

Background and Objectives. Covid-19 pandemic era impact on increasing children constipation which may be caused by a decrease in physical activity and sleep disorders in children. Functional constipation is a defecation disorder characterized by infrequent bowel movements, hard and painful stools. Prevalence in school children 0.7-29.6%. Constipation is related to lifestyle. We aimed to describe the lifestyle related to functional constipation in children aged 6-9 years during the Covid-19 pandemic.

Materials and Methods. A cross-sectional study was performed in children aged 6-9 years at Elementary Schools in Surabaya, Indonesia. Constipation was confirmed based on the validated Rome IV questionnaire.

Results. This study included 655 subjects from 5 elementary schools in Surabaya. Majority of the subjects were male (51.5%). Median age was 8 years, some subjects had normal nutritional status. Functional constipation was found in 236 children aged 6-9 years (36%). The most common defecation disorder was infrequent defecation at 82%. Low physical activity, sleep duration < 8 hours, and screen time > 4 hours are risk factors for functional constipation in children, especially aged 6-9 years.

Conclusions: There is an increased in the prevalence of functional constipation in children aged 6-9 years in Surabaya during Covid-19 pandemic. Low physical activity, sleep duration < 8 hours, and screen time >4 hours are lifestyle associated with functional constipation in children aged 6-9 years.

Keyword: functional constipation, children aged 6-9 years, lifestyle, Covid-19 pandemic

Abbreviations:

Covid-19 : Coronavirus Disease 2019

ENS : Enteric Nervous System

FGIDS : Functional Gastrointestinal Disorder

INTRODUCTION

Constipation is a prevalent and often challenging issue that affects many children, with significant implications for their quality of life and healthcare costs [1]. It is characterized by infrequent and/or painful defecation, fecal incontinence, and abdominal pain, affecting children's well-being and imposing stress on families. This condition is frequently encountered across all levels of healthcare, from primary to tertiary care settings [2,3]. The prevalence of constipation in childhood varies widely, with estimates ranging from 5% to 30% [4]. The underlying causes of constipation are painful defecation, fever, dehydration, dietary habits, psychological issues, toilet training, medications, and family history [5]. Notably, an unbalanced diet leading to overweight, poor toilet hygiene, and emotional stress are significant risk factors for constipation in elementary school children [1,6].

Since March 2020, the COVID-19 pandemic has brought unprecedented changes to daily life. The World Health Organization (WHO) declared COVID-19 a global pandemic, prompting widespread adaptations such as online schooling, restrictions on outdoor activities, and quarantine measures [7]. These changes have had profound effects on children's lifestyles, including reduced physical activity, sleep disturbances, and altered eating patterns all of which are known risk factors for constipation. Additionally, the stress and uncertainty brought about by the pandemic have contributed to sleep disorders and changes in dietary habits [8].

Emerging studies from various regions, including Europe, have highlighted how the pandemic has exacerbated these risk factors. The shift to online schooling, coupled with limited outdoor activities, has significantly reduced children's physical activity levels. Additionally, the stress and uncertainty brought about by the pandemic have contributed to sleep disorders and changes in dietary habits [8,9].

Understanding the lifestyle changes and their impact on childhood constipation during the COVID-19 pandemic is crucial for developing effective strategies to mitigate these issues. By examining these patterns, we can identify key areas for intervention and support to enhance the quality of life for these children and their families during these challenging times. This study aims to explore the lifestyle patterns of elementary school children aged 6-9 years in Surabaya which cause functional constipation during the pandemic.

MATERIALS AND METHODS

This was a cross-sectional study in elementary schools Surabaya, Indonesia from August 2023 – January 2024. The study population was children aged 6-9 years who lived in Surabaya and met the inclusion and exclusion criteria. The inclusion criteria in this study were children aged 6-9 years in elementary schools in Surabaya which randomly selected with the children's parents filled the written form. The exclusion criteria in this study were parents refusing to give permission for the child to participate, children undergoing abdominal surgery in the last one year, children diagnosed with malignancy, hormonal disorders, rheumatic diseases, or chronic gastrointestinal diseases, and children taking long-term medication such as antiepileptic drugs, anticholinergics, antihistamines, antispasmodics, corticosteroids, and non-steroidal anti-inflammatory drugs (NSAIDs). The drop-out criteria in this study were sample who withdrew from the study and the data was incomplete.

Each child included in the study was given a questionnaire consisting of the Rome IV questionnaire to detect the presence of functional constipation and basic data questionnaire that included demographics, physical activity as assessed by the physical activity questionnaire of children (PAQ-C), daily nutritional intake, screen time, and sleep patterns. The questionnaire was filled by the subject's parents and were collected by the study center coordinator for further data processing. The study data was processed using Microsoft Excel 2019 and presented in the form of tabulated tables and narratives.

We submitted ethical approval to the Hospital Ethics and Study Committee, Dr. Soetomo General Hospital, Surabaya, Indonesia with registration number 0738/KEPK/VIII/2023. Study subjects must also obtain written consent from the parents after explanation of the study procedures.

RESULTS

A total of 808 school children in 5 randomly selected elementary schools in each area Surabaya, 105 subjects were excluded because their parents refused to fill out the questionnaire and did not provide informed consent, 48 subjects were excluded because the questionnaire data was incomplete. Finally, there were 655 children included this study with the questionnaire was filled by the children's parents. The majority of children had normal nutritional status (46.6%).

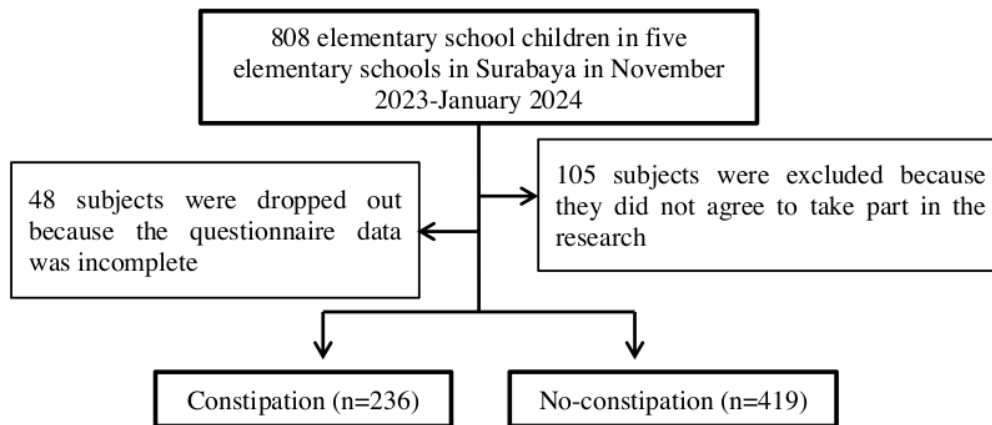


Figure 1. Study subject flow

Amount 236 children (36%) aged 6-9 years in this study met the criteria for functional constipation. The constipation occurred more frequently in girls (53.8%) (Table 1). Nearly 31% of children with defecation frequency less than two times a week, although the majority did not experience similar complaints. All of them had no family history of constipation (Table 2).

Table 1. Sample characteristics

Characteristics	Value
Sex	
Male	337 (51.5%)
Female	318 (48.5%)
Age (years)	8 years (6 – 10 years)
Body weight (kg)	25 kg (10.6 – 55 kg)
Body height (cm)	126 cm (100 – 160 cm)
Nutritional status according to Body Mass Index (BMI)	
Severe Malnutrition	24 (3.7%)
Underweight	161 (24.6%)
Normal	305 (46.6%)
Overweight	82 (12.5%)
Obesity	83 (12.6%)
Constipation	
No	419 (64%)
Yes	236 (36%)

Data is displayed in n (%), and median (range).

Table 2. Description of bowel movements

Bowel Movements	N (%)	p-value
Defecation Frequency <2 a week		0.002*
No	457 (69.8%)	
Yes	198 (30.2%)	
Stomach Pain		
No	601 (91.8%)	0.967
Yes	54 (8.2%)	
Big Stool		
No	558 (85.2%)	0.970
Yes	97 (14.8%)	
Fussiness During Defecation		
No	638 (97.4%)	0.593
Yes	17 (2.6%)	
Family History of Constipation		
No	655 (100%)	-
Yes	0 (0%)	

Data is displayed in n (%). *: significant

The lifestyle related to constipation incidence was conducted in children aged 6-9 years, which were screen time, sleep patterns, eating habits and physical activity, but had a significant impact on constipation incidence is screen time ≥ 4 hours, physical activity, and sleep patterns < 8 hours ($p = 0.000$, $p = 0.000$, and $p=0.012$) (Table 3). In the logistic regression test, it was found that children with a screen time habit of ≥ 4 hours had a 2.3 times greater risk of constipation, physical activity was a protective factor for constipation (RR, $1/0.383 = 2.610$), hence children with low physical activity were 2.6 times more likely to experience constipation, and sleep patterns < 8 hours had a 1.5 times greater risk of constipation (Table 3).

Table 3. Lifestyle patterns of constipation

Risk Factors	Constipation	No Constipation	RR (lower – upper)	p-value
Screen time				
< 4 hours	135 (57.2)	309 (73.7)	0.476 (0.340 – 0.667) ^{LR} 2.344	0.000*
≥ 4 hours	101 (42.8)	110 (26.3)		
Sleep pattern				
< 8 hours	97 (41.1)	141 (33.7)	0.702 (0.510 – 0.969) ^{LR} 1.538	0.012*
8 – 10 hours	106 (44.9)	225 (53.7)	1.123 (0.704 – 1.791)	0.627
> 10 hours	33 (14)	53 (12.6)	1.376 (0.990 – 1.912)	0.057
Physical activities				
Poor <60.5	142 (60.2)	166 (39.6)	^{LR} 0.383	0.000*
Good ≥60,5	94 (39.8)	253 (60.4)	2.302 (1.662 – 3.190)	
Consumption of food with artificial sweeteners				
Rare	29 (12.3)	55 (13.1)	0.927 (0.573 – 1.500)	0.758
Once per week	133 (56.4)	240 (57.3)	0.963 (0.698 – 1.329)	0.819
Daily	74 (31.3)	124 (29.6)	1.087 (0.769 – 1.536)	0.637
Consumption of fast food				
Rare	54 (22.9)	107 (25.5)	0.887 (0.609 – 1.292)	0.532
Once per week	152 (64.4)	264 (63)	1.062 (0.762 – 1.481)	0.721
Daily	30 (12.7)	48 (11.5)	1.075 (0.663 – 1.743)	0.770
High salt intake				
Rare	46 (19.5)	85 (20.3)	0.951 (0.637 – 1.420)	0.807
Once per week	143 (60.6)	249 (59.4)	1.050 (0.758 – 1.454)	0.770
Daily	47 (19.9)	85 (20.3)	0.977 (0.656 – 1.455)	0.909

Chi-square test; RR = Relative Ratio; *p-value <0.05 statistically significant;

^{LR}Logistic Regression

DISCUSSION

This study highlighted a notable increase in the incidence of functional constipation among children aged 6-9 years in Surabaya during the COVID-19 pandemic, aligning with prior research that documented a 1.3 to 2.1-fold rise in constipation cases during this period [10]. The most common complaints included infrequent defecation, large stools, and pain during defecation, which are consistent with the symptoms commonly observed in pediatric constipation cases. The study

echoes findings from research in Iowa, where 41.3% of children with constipation reported infrequent defecation [11]. The study from Isa and Borowitz et al., mentioned that children who identified painful defecation as a primary factor leading to stool retention and worsening constipation [12,13].

When pain occurred during defecation, children tend to retain stool. During the retaining process, the rectal mucosa absorbs water from the stool mass, making it more solid larger over time and thus leading to difficult defecation process. Therefore, when the urge to defecate arises, children tend to restrain their urge and hide from their parents until the urge is gone. The expulsion of these fecal masses is painful and sometimes causes an anal fissure, which further aggravates the pain and triggers stool retention. This creates a vicious cycle of retaining stool [14]. Constipation was more frequently observed in female children, although the gender difference was not statistically significant. This trend is supported by several studies that suggest girls may be more prone to constipation due to factors like reluctance to use public toilets and physiological differences, such as longer gastrointestinal transit times and lower colon pressure activity [13,15-18].

The bivariate analysis in this study identified several risk factors for functional constipation, including gender, excessive screen time, inadequate sleep, and low physical activity [19]. Prolonged screen time, defined as more than four hours daily, was a significant risk factor, consistent with findings from Bangladesh and Japan, where excessive screen use correlated with higher constipation rates. Inadequate sleep, defined as less than eight hours per night, was also a risk factor, mirroring results from a Hong Kong study linking insufficient sleep with increased constipation incidence due to the disruption of regular bowel habits and psychological stress from academic pressures [20,21].

The previous study showed that a link between insufficient sleep and worse constipation symptoms, impaired anorectal function and perception, and impaired autonomic function in patients with functional constipation. Sleep duration of less than 7 hours during the night, busy after-school life with homework and inadequate sleep were linked to constipation. Heavy load with homework after school might be an obstacle to the development of regular bowel habits at home at night and might encourage defecation delays. Inadequate sleep, especially when associated with strenuous academic activities, might be a source of psychological distress for children. Fatigue resulting from inadequate sleep could also reduce children's urge to

use the toilet and prefer to delay defecation [22,23].

Physical activity emerged as a protective factor against constipation, with children who engaged in regular physical activity being less likely to suffer from constipation. This aligns with findings by Seidenfaden et al., which demonstrated that physical activity positively impacts mental health and bowel movements. Interestingly, dietary factors such as the consumption of fast food and artificially sweetened snacks did not significantly correlate with constipation in this study, underscoring the multifaceted nature of the condition and the need for comprehensive research to pinpoint relevant risk factors [24,25]. Other factors commonly thought to contribute to constipation, such as consumption of fast food, artificially sweetened foods, and snacks with high salt content, were not significantly associated with the incidence of constipation in the children in our study. This highlights the complexity in understanding the factors influencing the condition and emphasizes the importance of careful research in identifying relevant risk factors.

The COVID-19 pandemic fundamentally altered children's lifestyles, reducing physical activity, increasing screen time, and disturbing sleep patterns, all of which correlated with a rise in constipation cases. These lifestyle changes, driven by lockdowns and social distancing measures, disrupted daily routines, including diet and physical activity, and negatively impacted digestive health. Reduced physical activity slows digestion, while excessive screen use and its associated blue light exposure disrupt sleep, further affecting bowel function. The uncertainty and altered schedules during the pandemic likely contributed to irregular bowel routines, exacerbating constipation [26].

LIMITATION OF THE STUDY

This study's limitations include its cross-sectional design, which provides a snapshot in time but cannot establish causality between lifestyle changes and constipation. The random sampling from Surabaya elementary schools may not be representative of the broader population, and the single-time data collection introduces potential observational bias. Exclusion criteria may have been overly stringent, excluding children who could offer additional insights into constipation. Furthermore, the study didn't account for environmental factors, such as toilet cleanliness at schools.

9

CONCLUSION

The COVID-19 pandemic has significantly impacted the lifestyle patterns of children aged 6-9 years, leading to an increase in functional constipation. This study underscores the critical roles of regular physical activity, adequate sleep, and limited screen time in preventing constipation. Adopting these lifestyle modifications is essential to mitigate the risk of constipation, especially during periods of significant lifestyle disruption like the pandemic.

10

CONFLICT OF INTEREST

The authors have no conflict of interest to disclose

AUTHOR'S CONTRIBUTIONS

Author's contributions: Conceptualization, S.N., R.G.R, A.F.A, S.M.S, A.D; methodology, S.N., R.G.R, A.F.A, S, S.M.S and A.D; validation, S.N., R.G.R, A.F.A and S; formal analysis, S.N; investigation, S.N., R.G.R, A.F.A and S; resources, S.N; data curation, S.N and S; writing – original draft preparation, S.N; writing – review and editing, R.G.R, A.F.A, S.M.S, A.D and K.R.S; visualization, S.N; supervision, R.G.R and A.F.A; project administration, S.N; funding acquisition, S.N, R.G.R, A.F.A and A.D.

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REFERENCES

1. Tabbers M, Di-Lorenzo C, Berger M, Faure C, Langendam M, and Nurko S. Evaluation and Treatment of Functional Constipation in Infants and Children: Evidence-Based Recommendations from ESPGHAN and NASPGHAN. *Journal Pediatric Gastroenterology Nutrition*. 2014;58(2):258–74. doi: 10.1097/MPG.0000000000000266.
2. Rajindrajith S, Devanarayana N, Benninga M. Review Article: Faecal Incontinence in Children: Epidemiology, Pathophysiology, Clinical Evaluation and Management. *Aliment Pharmacology Therapy*. 2013;37(1):37–48. doi: 10.1111/apt.12103.
3. Van-Tilburg M, Hyman P, Walker L, Rouster A, Palsson O, and Kim S. Prevalence of Functional Gastrointestinal Disorders in Infants and Toddlers. *Journal Pediatric*. 2015;166(3):684–9. doi: 10.1016/j.jpeds.2014.11.039.
4. Rahim S. Childhood Constipation. *InnovAiT*. 2019;12(11):626–34. doi: 10.1177/1755738019867995.
5. NICE. Constipation in Children and Young People: Diagnosis and Management. Clinical Guideline [Internet]. 2010 [cited 2024 Jun 5]. Available from: <https://www.nice.org.uk/guidance/cg99/resources/constipation-in-children-and-young-people-diagnosis-and-management-pdf-975757753285>.
6. Xinias I, and Mavroudi A. Constipation in Childhood. An Update on Evaluation and Management. *Hippokratia*. 2015;19(1):11–9. PMID: 26435640.
7. Remes-Troche J, Coss-Adame E, Amieva-Balmori M, Velasco A, Gomez-Castanos P, and Flores-Rendon R. Incidence of 'New Onset' Constipation and Associated Factors during Lockdown due to the Covid-19 Pandemic. *BMJ Open Gastroenterology*. 2021;8(1):1–17. doi: 10.1136/bmjgast-2021-000729.
8. Giménez-Dasí M, Quintanilla L, Lucas-Molina B, and Sarmento-Henrique R. Six Weeks of Confinement: Psychological Effects on a Sample of Children in Early Childhood and Primary Education. *Frontier Psychology*. 2020;11:1–16. doi: 10.3389/fpsyg.2020.590463.
9. Kairupan T, Rokot N, Lestari H, Rampengan N, and Kairupan BH. Behavioral and Emotional Changes in Early Childhood during the COVID19 Pandemic. *e-CliniC*. 2021;9(2):402–11. doi: 10.35790/ecl.v9i2.34014.
10. Patel A, Lindmoen C, Kahlon G, and Kondamudi N. Impact of Covid-19 on the

- Prevalence of Constipation in the Emergency Department. *Journal Pediatric Gastroenterology Nutritional*. 2022;75(1):448–9. doi: 10.23750/abm.v92i6.11212.
11. Loening-Baucke V. Prevalence Rates for Constipation and Faecal and Urinary Incontinence. *Arch Dis Child*. 2007;92(6):486–9. doi: 10.1136/adc.2006.098335.
 12. Borowitz S, Ritterband L, Tam A, Cox D, Penberthy J, Sutphen J. Precipitants of Constipation during Early Childhood. *J Am Board Fam Pract*. 2003;16(3):213–8. doi: 10.3122/jabfm.16.3.213.
 13. Isa HM, Alkharsi FA, Salman FA, Ali MS, Abdulnabibi ZK, and Mohammed AM. Assessing Indicators and Clinical Differences between Functional and Organic Childhood Constipation: A Restrospective Study in Pediatric Gastroenterology Clinic. *Clinical and Experimental Pediatrics*. 2023;66(7):296–306. doi: 10.3345/cep.2022.01298.
 14. Rajindrajith S, Devanarayana N. Constipation in Children: Novel Insight into Epidemiology, Pathophysiology and Management and Motility. *Journal of Neurogastroenterology*. 2011;17(1):35–47. doi: 10.5056/jnm.2011.17.1.35.
 15. Turco R, Miele E, Russo M, Mastroianni R, Lavorgna A, and Paludetto R. Early-life Factors Associated with Pediatric Functional Constipation. *Journal Pediatric Gastroenterology Nutrition*. 2014;58(3):307–12. doi: 10.1097/MPG.0000000000000209.
 16. Dehghani S, Kulouee N, Honar N, Imanieh M, Haghighat M, and Javaherizadeh H. Clinical Manifestations among Children with Chronic Functional Constipation. *Middle East J Dig Dis*. 2015;7(1):31–5. PMID: 25628851.
 17. Haghighat M, Amiri Z, Deghani S, Safarpour A, Attaollahi M, et al. Investigation of Demographic and Clinical Characteristics of Children with Constipation Referring to the Pediatric Gastrointestinal Clinic, Shiraz in 2014 – 2016. *Shiraz Electric Medical Journal*. 2018;19(2):1–5. doi: 10.5812/semj.13669.
 18. Yamada M, Sekine M, and Tatsuse T. Results from the Toyama Birth Cohort Study. *Pediatrics International*. 2021;59:604–13. doi: 10.1186/s12889-020-10044-5.
 19. Nelson M, Neumark-Stzainer D, Hannan P, Sirard J, Story M. Longitudinal

- and Secular Trends in Physical Activity and Sedentary Behavior during Adolescence. *Pediatrics*. 2006;118(6):1627–34. doi: 10.1542/peds.2006-0926.
20. Benzamin M, Karim AB, Rukunuzzaman, Mazumder W, Rana M, Alam R, et al. Functional Constipation in Bangladesh School Aged Children: A Hidden Misty at Community. *World J Clin Pediatr*. 2022;11(2):160–72. doi: 10.5409/wjcp.v11.i2.160.
 21. Kohyama J. Lifestyle Habits Associated with Poor Defecation Habit among Pupils in Japan. *Pediatric Gastroenterology Hepatology Nutrition*. 2020;23(6):567–76. doi: 10.5223/pghn.2020.23.6.567.
 22. Tam Y, Li A, So H, Shit K, Pang K, Wong Y, et al. Socioenvironmental Factors Associated with Constipation in Hong Kong Children and Rome III Criteria. *J Pediatr Gastroenterol Nutr*. 2012;55(1):1–5. doi: 10.1097/MPG.0b013e31824741ce.
 23. Liu J, Wang W, Tian J, Lv C, Fu Y, Fass R, et al. Sleep Deficiency Is Associated with Exacerbation of Symptoms and Impairment of Anorectal and Autonomic Functions in Patients with Functional Constipation. *Front Neurosci*. 2022;16(7):1–10. doi: 10.3389/fnins.2022.912442.
 24. Seidenfaden S, Ormarsson O, Lund S, and Bjornsson E. Physical Activity may Decrease the Likelihood of Children Developing Constipation. *Acta Paediatric*. 2018;107(1):151–5. doi: 10.1111/apa.14067.
 25. Hosseinzadeh S, Poorsaadati S, Radkani B, Forootan M. Psychological Disorders in Patients with Chronic Constipation. *Gastroenterol Hepatol Bed Bench*. 2011;4(3):159–63. PMID: 24834176.
 26. Okely A, Kariippanon K, Guan H, Taylor E, Suesse T, Cross P, et al. Global Effect of COVID-19 Pandemic on Physical Activity, Sedentary Behaviour and Sleep among 3- to 5-year-old children: a Longitudinal Study of 14 Countries. *BMC Public Health*. 2021;21(1):940. doi: 10.1186/s12889-021-10852-3.