The impact of national lockdown on nutritional status of children with inflammatory bowel disease

Running head: Nutritional status in children with IBD during COVID-19 pandemic

Authors: Marino LV[1,2,3,], Ashton JJ[3,4,5], Beattie RM[3,4,5]

Affiliations:

1. Department of Dietetics and Speech & Language Therapy, University Hospital Southampton NHS Foundation Trust, Southampton
2. Nutrition & Dietetics, Faculty of Health and Well Being, University of Winchester, United Kingdom
3. NIHR Biomedical Research Centre Southampton, University Hospital Southampton NHS Foundation Trust, Southampton,
4. Paediatric Gastroenterology, Southampton Children's Hospital, University Hospital Southampton NHS Foundation Trust, Southampton
5. Faculty of Medicine, Southampton University, Southampton

Corresponding author:

Professor Mark Beattie, University Hospital Southampton NHS Foundation Trust, Southampton, UK S016 6YD Tel: + 44 (0) 23 8079 6000 Email: mark.beattie@uhs.nhs.uk

Financial support and conflicts of interest:

There is no funding associated with this work and the authors have no conflict of interests.

Authors' contributions

All authors have made substantial contributions to all areas of this manuscript data collection and statistical analyses. All authors edited, read and approved the final manuscript.

Acknowledgements

None

Keywords: inflammatory bowel disease, children, malnutrition, COVID-19, nutritional status, overweight

WORD COUNT: **Abstract**: 250/250; **Full text**: 1200/1200 Words; 1 Table, 1 Figure

The impact of national lockdown on nutritional status of children with inflammatory bowel disease

Running head: Nutritional status in children with IBD during COVID-19 pandemic

Authors: Marino LV[1,2,3,], Ashton JJ[3,4,5], Beattie RM[3,4,5]

Affiliations:

1. Department of Dietetics and Speech & Language Therapy, University Hospital Southampton NHS Foundation Trust, Southampton
2. Nutrition & Dietetics, Faculty of Health and Well Being, University of Winchester, United Kingdom
3. NIHR Biomedical Research Centre Southampton, University Hospital Southampton NHS Foundation Trust, Southampton,
4. Paediatric Gastroenterology, Southampton Children's Hospital, University Hospital Southampton NHS Foundation Trust, Southampton
5. Faculty of Medicine, Southampton University, Southampton

Corresponding author:

Professor Mark Beattie, University Hospital Southampton NHS Foundation Trust, Southampton, UK S016 6YD Tel: + 44 (0) 23 8079 6000 Email: mark.beattie@uhs.nhs.uk

Financial support and conflicts of interest:

There is no funding associated with this work and the authors have no conflict of interests.

Authors' contributions

All authors have made substantial contributions to all areas of this manuscript data collection and statistical analyses. All authors edited, read and approved the final manuscript.

Acknowledgements

None

Keywords: inflammatory bowel disease, children, malnutrition, COVID-19, nutritional status, overweight

WORD COUNT: **Abstract**: 250/250; **Full text**: 1200/1200 Words; 1 Table, 1 Figure

Abstract

Introduction

The COVID-19 pandemic has had wide reaching primary and secondary health implications. The United Kingdom (UK) government implemented a lockdown to slow the rate of infection at the end of March 2020 lasting until early summer 2020. Results from a UK nationwide survey suggest the majority of IBD patients were followed up using technology enabled care services during this time. We therefore sought to explore the impact of the pandemic on nutritional status of children with inflammatory bowel disease, focusing on the effect of national lockdown from March to early summer 2020.

Methods

A retrospective study was conducted. All patients with a diagnosis of inflammatory bowel disease , aged <18 years, and under the care of Southampton Children's Hospital were eligible for inclusion. Those patients who attended an outpatient-appointment in time-period-one (November 2019-February 2020), and following the period of national lockdown, time-period-two (July-November 2020) were included in the analysis.

Results

116 patients had paired measures. Using the World-Health-Organisation criteria of nutritional-status, 19% (n=22/116) were mildly-malnourished body mass index z score <-1. In this group the mean BMIZ-1.3±0.9 at time-point-1 vs. -1.9±0.9 at time-point-2 (p=0.03). The mean body mass index z score of those overweight at time-point-one of 1.2±1.2 vs. 1.6±1.4 in time-point-two (p=0.2) During the period of lockdown 27% of malnourished children(n=6/22) had a technology enable care nutrition review, 2% of normally-nourished (body mass index Z>-1to<1), (n=1/51) (p=<0.0001) and none of overweight (body mass index Z>1), (n=0/43) children (p=<0.0001).

Conclusion

Dietetic reviews were severely restricted during the lockdown. Patients with low body mass index z prior to lockdown became more malnourished. During the ongoing pandemic it is important to identify those children with nutrition risk, focusing support on this group of children.

Introduction

The COVID-19 pandemic has had wide reaching primary and secondary health implications [1]. The United Kingdom government implemented a strict lockdown to slow the rate of infection at the end of March 2020 lasting until early June 2020. During this period the National Health Service (NHS) experienced unprecedented cessation of many outpatient clinics and all elective surgical procedures from March to June 2020.

Inflammatory bowel disease (IBD), including Crohn's disease (CD), ulcerative colitis (UC) and IBD unclassified is a chronic, relapsing inflammatory disease involving the gastrointestinal tract. Malnutrition has frequently been associated with Crohn's disease, leading to a lean mass deficit and growth delay [2, 3]. Nutritional support and routine growth monitoring remain a vital aspect of management of CD [4]. In response to the COVID-19 pandemic the British Society of Gastroenterology published rigorous recommendations on medical management of IBD [5]. A UK nationwide survey of tertiary paediatric services provided during the first national lockdown (March – June 2020) suggested the majority of IBD patients were followed up remotely either via a video or telephone call using technology enabled care services (TECS) [6]. We therefore, sought to complete a retrospective chart review to explore the impact of the pandemic on growth children with IBD, during the time period of the first national lockdown, in order to better identify those children who would benefit from more frequent contact and support in subsequent periods where routine access to face to face healthcare may be reduced.

Materials and methods

Subjects and setting

A retrospective study was completed of all paediatric patients with IBD under the care of Southampton Children's Hospital, all patients were aged <18-years. Patients who attended an outpatient appointment in both time period one, prior to the national lockdown (November 2019 to February 2020), and time period two, following the period of national lockdown (July to November

2020) were included in this study. The first period of national lockdown was from March 23rd 2020 – May 31st 2020.

Anthropometric measurements

Anthropometric measurements were performed and recorded in accordance with local Standardised Operating Procedures and World Health Organisation (WHO) guidelines [7]. Z-scores were calculated using WHO Anthro software (version 3.3.3, 2011)[8]. WHO growth reference interpretation of cut offs for body-mass-index z (BMIZ) scores defined as mild malnutrition <-1 z score, normal >-1 to <1 and overweight as >1[7].

At each outpatient appointment anthropometric measurements are entered into the patient's electronic patient record (EPR). An EPR data specialist extracted the dataset from the patient electronic record and downloaded into Microsoft Excel (Microsoft Corp., Redmond, WA, USA).

Statistical analyses

Statistical analyses were performed in Prism Graph Pad (Graph Pad Software, San Diego, CA, USA). Results are expressed as means with standard deviation, median and interquartile range... Non parametric t-tests and Chi squared tests were used. Statistical significance was taken as $p<0.05$.

The retrospective study was registered as a service evaluation within the NHS Trust (reference SEV/0268)

Results

Demographics of IBD cohort

A total of 116 patients met the study criteria with anthropometry recorded at time point one and two. Of the cohort 54% (n=62/116) were male. The mean age of children at time point 1 was 13.3±2.9 and time point 2 was 14.2±2.8. Considering disease subtype, 54% (n=62/116) of patients had a diagnosis of Crohn's disease and 46% (n=54/116) had a diagnosis of ulcerative colitis.

Change in nutrition status during national lockdown

Of the cohort 19% (n=22/116) had mild malnutrition, with a mean BMIZ-1.3±0.9 in time point one compared to a mean BMIZ of -1.9±0.9 in time point two, and a statistically significant mean delta change in BMIZ of -0.6±1.5 (p=0.03). There was also a significant difference between the delta change of thin children -0.6±1.5 compared to normal BMIZ children 0.1±0.6 (p=0.01) Children who had a normal BMIZ, were 44% (n=51/116) of the cohort. The mean BMIZ for the normally nourished group in time point one was 0.1±0.6 compared to a mean BMIZ of 0.2±0.6 in time point two, with a mean delta change in BMIZ of 0.1±0.6 (p=0.5). Children who were overweight represented 37% (n=43/116) of the cohort, and during national lockdown there was minimal change in BMIZ. The mean BMIZ for the overweight group at time point one of 1.2±1.2 compared to a mean BMIZ of 1.6±1.4 in time point two, with a mean delta change in BMIZ of 0.04±0.2 (p=0.5) (Table 1, Figure 1).

During the first period of lockdown, a total of 6% (n=7/116) of children had a TECS dietetic review, of which 27% (n=6/22) of children with a BMIZ<1 had a TECS dietetic review compared to 2% (n=1/51) of those who were normally nourished (BMIZ >-1 to <1.0) (p=<0.0001), and no patients who were overweight (BMIZ>1) (n=0/43) (p=<0.0001).

Discussion

This retrospective review demonstrates children who were overweight at the start of the lockdown period in March 2020 had a stable BMI, however malnourished children, experienced a decline in their nutritional status. There may be a number of factors involved in changes to nutritional status during this time including; i) reduced health care delivery arising from an almost overnight transition of dietetics serviecs to providing remote consultations via TECS, ii) pyschological impact of COVID-19 on families[9], iii) for children who are of normal may have risk of becoming overweight due to poorer food choices with reduced physical activity[10, 11] and iii) reduced health care professional availability due to staff absence arising from COVID-19 infection and stress[12] Although there were significant challenges in providing nutrition reviews during this time a proporption of children with mild

malnutrition were reviewed by a dietitian. These data confirm a proportion of those at increased nutritional risk were followed up despite the considerable challenges in providing nutrition reviews during this time. Children with IBD are managed by a multi-professional group of HCPs including nurses, psychologists, doctors and dietitians. During the first national lockdown, children with IBD had reduced access to a range of health care professionals within the multi-professional group

Perhaps a significant and unexpected challenge for HCPs and parents alike during the national lockdown has been how to adequately monitor growth and assess nutrition risk, via TECS including remote telephone or video-consultation. As children with IBD have lifelong health which may impact on their growth, regular growth monitoring is important, and as such having access to sufficient equipment/expertise to monitor growth virtually will be an important consideration for TECS in the months to come. HCPs became rapidly aware many families do not have access to sufficient equipment to complete growth monitoring remotely e.g. digital scales or tape measures and as such it is likely to be more challenging to discern those children with changing nutritional status [13]. As a community we need to rapidly develop validated tools to guide nutrition assessment including parental measurements of anthropometry via remote consultation [14]. This is of particular concern as the pandemic is anticipated to increase all forms of impaired nutrition arising from disruption from health services, including those relating to food security and poverty [15], negative impact on mental health [16] and missed opportunities to adequately address declining nutritional-status [15], particularly if measures of weight and height/ length are inaccurate. This includes the potential increase in the number children with overweight/obesity, as well as those with active disease and gastrointestinal symptoms resulting in weight loss [10].

In order to better support families and young people during this and subsequent periods of lockdown we need to consider strategies, that better support remote growth monitoring developing validated assessment toolkits that are not reliant on weight and height measures, but something that

families are easily able to complete as part of a remote TECS consultation. To future proof services we need to ensure HCPs has sufficient knowledge and skills to run TECS; setting up guidelines and work processes around service delivery. As part of dietetic TECS for children with IBD, we also need to consider the use of automated nutrition referral for those who have breached pre-defined anthropometric BMIZ cut offs. This will help to improve the identification of children with declining nutritional status e.g. under- and over-nutrition, allowing for timely personalized nutrition support [17, 18]. This health care transformation is extraordinary and has the potential to reduce variation of care provided, improve outcomes and reduce inefficiencies of hospital based outpatient appointments e.g. time of work/ school, but we need to pay attention to the details particularly how we identify those with nutrition risk, and keep-going.

Conclusion

Dietetic reviews were severely restricted during the lockdown. During the ongoing pandemic it is important to better identify those children with nutrition risk, focusing nutrition support TECS on those groups of children who may be at risk.

References

1. World Health Organisation (WHO). Coronavirus disease (COVID-19) Pandemic Geneva: World Health Organisation, Geneva; 2020 [cited 2020 6 May 2020]. Available from: https://www.who.int/emergencies/diseases/novel-coronavirus-2019.
2. Griffiths AM. Growth retardation in early-onset inflammatory bowel disease: should we monitor and treat these patients differently? Digestive diseases (Basel, Switzerland). 2009;27(3):404-11. PubMed PMID: 19786772. Epub 2009/09/30. eng.
3. Heuschkel R, Salvestrini C, Beattie RM, Hildebrand H, Walters T, Griffiths A. Guidelines for the management of growth failure in childhood inflammatory bowel disease. Inflamm Bowel Dis. 2008 Jun;14(6):839-49. PubMed PMID: 18266237. Epub 2008/02/13. eng.
4. Gavin J, Ashton JJ, Heather N, Marino LV, Beattie RM. Nutritional support in paediatric Crohn's disease: outcome at 12 months. Acta paediatrica (Oslo, Norway : 1992). 2018 Jan;107(1):156-62. PubMed PMID: 28901585. Epub 2017/09/14. eng.
5. Kennedy NA, Jones GR, Lamb CA, Appleby R, Arnott I, Beattie RM, et al. British Society of Gastroenterology guidance for management of inflammatory bowel disease during the COVID-19 pandemic. Gut. 2020 Jun;69(6):984-90. PubMed PMID: 32303607. Pubmed Central PMCID: PMC7211081. Epub 2020/04/19. eng.
6. Ashton JJ, Kammermeier J, Spray C, Russell RK, Hansen R, Howarth LJ, et al. Impact of COVID-19 on diagnosis and management of paediatric inflammatory bowel disease during lockdown: a UK nationwide study. Arch Dis Child. 2020 Jul 30. PubMed PMID: 32732316. Epub 2020/08/01. eng.
7. World Health Organisation (WHO). Growth reference 5-19 years: BMI-for-age (5-19years) 2015. Available from: http://www.who.int/growthref/who2007_bmi_for_age/en/.
8. World Health Organisation. (WHO) Anthro (version 3.2.2, January 2011). 2015.
9. Darlington AE, Morgan JE, Wagland R, Sodergren SC, Culliford D, Gamble A, et al. COVID-19 and children with cancer: Parents' experiences, anxieties and support needs. Pediatric blood & cancer. 2020 Nov 21:e28790. PubMed PMID: 33219739. Epub 2020/11/22. eng.
10. Almandoz JP, Xie L, Schellinger JN, Mathew MS, Gazda C, Ofori A, et al. Impact of COVID-19 stay-at-home orders on weight-related behaviours among patients with obesity. Clinical obesity. 2020 Oct;10(5):e12386. PubMed PMID: 32515555. Pubmed Central PMCID: PMC7300461. Epub 2020/06/10. eng.
11. Snuggs S, McGregor S. Food & meal decision making in lockdown: How and who has Covid-19 affected? Food quality and preference. 2020 Nov 25:104145. PubMed PMID: 33250586. Pubmed Central PMCID: PMC7685931. Epub 2020/12/01. eng.
12. Teixeira CFS, Soares CM, Souza EA, Lisboa ES, Pinto ICM, Andrade LR, et al. The health of healthcare professionals coping with the Covid-19 pandemic. Ciencia & saude coletiva. 2020 Sep;25(9):3465-74. PubMed PMID: 32876270. Epub 2020/09/03. A saúde dos profissionais de saúde no enfrentamento da pandemia de Covid-19. eng
por.
13. Marino LV Cooke L, Meyer R. Remote consultations: experience and training needs analysis of paediatric dietitians during the COVID-19 pandemic. In: LV M, editor. Submitted for publication JHDN 16.12.20 ed2020.
14. Marino LV Meyer R. British Dietetic Association Paediatric Specialist Group: COVID-19 - Guidelines for Remote Dietetic Consultations Birmingham: British Dietetic Association; 2020 [cited 2020 20 November 2020]. Available from: https://www.bda.uk.com/uploads/assets/7bf38706-cf65-4bbe-97eec8f59928cbf9/BDA-PSG-Guidelines-for-Remote-Dietetic-Consultations-Final-2420.pdf.
15. Headey D, Heidkamp R, Osendarp S, Ruel M, Scott N, Black R, et al. Impacts of COVID-19 on childhood malnutrition and nutrition-related mortality. Lancet. 2020 Aug 22;396(10250):519-21. PubMed PMID: 32730743. Pubmed Central PMCID: PMC7384798. Epub 2020/07/31. eng.
16. Singh S, Roy D, Sinha K, Parveen S, Sharma G, Joshi G. Impact of COVID-19 and lockdown on mental health of children and adolescents: A narrative review with recommendations. Psychiatry research. 2020 Nov;293:113429. PubMed PMID: 32882598. Pubmed Central PMCID: PMC7444649. Epub 2020/09/04. eng.
17. Karagiozoglou-Lampoudi T, Daskalou E, Lampoudis D, Apostolou A, Agakidis C. Computer-based malnutrition risk calculation may enhance the ability to identify pediatric patients at malnutrition-related risk for unfavorable outcome. JPEN Journal of parenteral and enteral nutrition. 2015 May;39(4):418-25. PubMed PMID: 24718785. Epub 2014/04/11. eng.

213 18. Marino LV, Thomas PC, Beattie RM. Screening tools for paediatric malnutrition: are we there yet? Curr
214 Opin Clin Nutr Metab Care. 2018 May;21(3):184-94. PubMed PMID: 29432295. Epub 2018/02/13. eng.
215
216

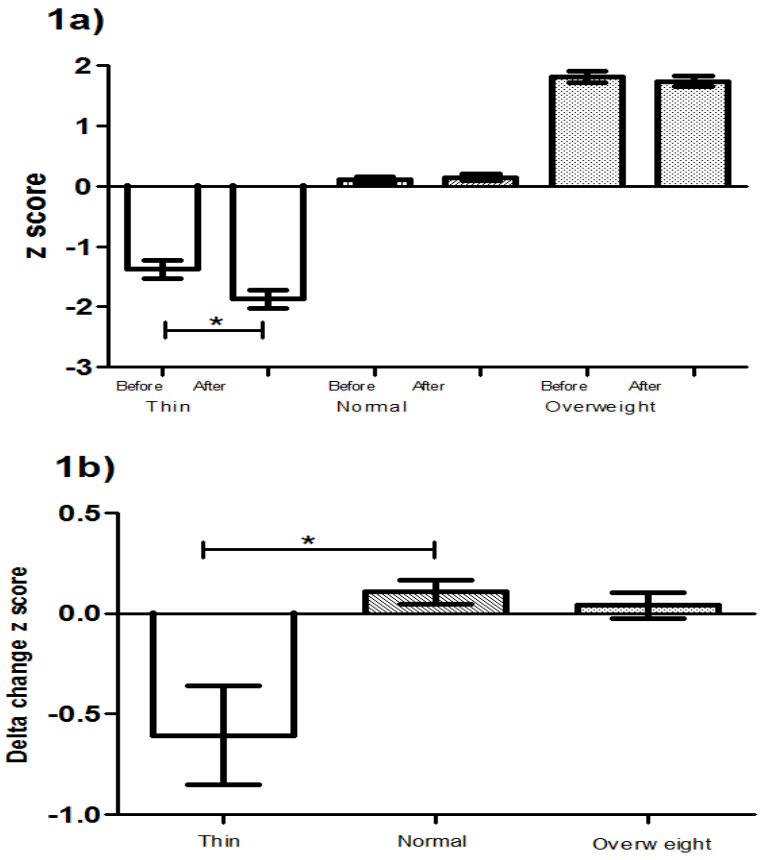

Figure 1a: Changes in body mass index score z (BMIZ) scores pre and post-strict national lockdown, children with mild malnutrition (thin) (n=22) (*p=0.03), normal nutritional status (n=51) (p=0.5), overweight (n=43) (p=0.2). 1b) Delta change of z scores pre and post- strict national lockdown, mild malnutrition (thin) and normal nutritional status (*p=0.01), mild malnutrition and overweight (p=0.09) and normal nutritional status and overweight (p=0.3)

Table 1: Body Mass Index Z (BMIZ) scores before and after national lockdown, with delta change in BMIZ score. Median (interquartile range), (Mean ±standard deviation)

	BMIZ Before	BMIZ After	Delta change BMIZ	p value
Malnutrition (BMIZ <-1) (n=22)	-1.5 (-2.0,-1.0) (-1.4±0.9)	-1.6 (-2.0,-1.3) (-1.9±0.9)	-0.2 (-0.8,0.4) (-0.6±1.5)	p=0.03
Normal (BMIZ >-1 to <1) (n=51)	0.1 (-0.3,0.6) (0.1±0.6)	0.2 (-0.3,0.7) (0.2±0.6)	0.1 (-0.3,0.6) (0.1±0.6)	p=0.5
Overweight (BMIZ >1) (n=43)	1.5 (1.2,2.1) (1.8±0.8)	1.5 (1.2,2) (1.7±0.7)	0.02 (-0.2,0.3) (0.04±0.2)	p=0.2