Increased incidence of severe nutritional anaemia in Yorkshire and Humber during the COVID-19 pandemic with critical clinical decompensation

Over the last year, the Yorkshire and Humber region has seen an increased incidence of severe nutritional anaemia (NA) presenting with cardiovascular compromise and systemic decompensation. We hypothesise that this is, in part at least, arising as an indirect consequence of the current COVID-19 pandemic.

We retrospectively analysed data from the seven paediatric departments in our region, identifying all children <16 years of age presenting with severe anaemia (haemoglobin (Hb) <50 g/L) between 1 January 2019 and 31 December 2020. One hundred and eighty-seven cases were identified, including 60 cases of NA (table 1), the vast majority of which were due to iron deficiency. Although the *number* of severe NA cases diagnosed fell from 34 in 2019 to 26 during the pandemic in 2020, the actual *severity* of anaemia at presentation was increased (figure 1). There was a significant drop in mean Hb at presentation from 40g/L in 2019 to 33g/L in 2020 (p=0.024), reflecting a doubling of cases with critical anaemia (Hb <30 g/L) in 2020 (table 2). While 12 (35%) cases in 2019 were identified by community services, this fell to just four (15%) cases in 2020 with a concomitant rise in cases presenting to emergency services: 12 (46%) in 2020 compared with 8 (23%) in 2019. The proportion requiring transfusion doubled from 29% to 58% in 2020 (p=0.028).

A number of factors, arising indirectly from the pandemic, may explain these findings. Constant reinforcement of the 'stay at home' message decreased direct interaction between all health professionals and children with a reliance on virtual consultations. This has particularly affected the preschool population,[1 2] reducing the opportunity to detect risk factors for, and signs of, evolving NA. Limitation of social contact has also reduced the opportunity for other professionals involved in early years care, such as teachers and nursery workers, as well as experienced family members, to identify a child at risk of NA.

Additionally, the pandemic has led to a widening of socioeconomic inequalities, increased unemployment and reduced household earning capacities, presenting a further challenge to families' ability to purchase balanced, good quality nutrition for their children.[3] The impact of health inequalities in this population is being explored further.

In summary, our analysis has identified an increased incidence of critical NA within the paediatric population. This appears to be an indirect result of the pandemic and may have fatal consequences. We believe that it is imperative we raise awareness of this within the wider community of health professionals in primary and secondary care. Yorkshire

Table 1 All cases of severe childhood anaemia 2019–2020 inclusive by cause

		2019	2020	Total
Malignancy	Haematological	30	16	46
	Non-haematological	8	12	20
Congenital	Haematological*	9	7	16
	Metabolic	1	0	1
Neonatal†		1	1	2
Existing comorbidity	Gastrointestinal	2	3	5
	Renal	1	2	3
	Cardiac	1	1	2
	Hepatic	1	1	2
	Complex care needs	2	0	2
	Respiratory	1	0	1
Acute infection		1	1	2
Drug induced	Azathioprine	1	0	1
Blood loss	Menorrhagia	2	3	5
	Feto-maternal	1	3	4
	Gastrointestinal	2	1	3
	Postoperative	1	1	2
Spurious		4	4	8
Undiagnosed		0	2	2
Nutritional anaemia‡	Isolated iron deficiency	21	19	40
	Mixed iron and folate deficiency	12	6	18
	Isolated B12 deficiency	1	1	2
	Isolated folate deficiency	0	0	0
Total		103	84	187

*This includes children diagnosed with haemoglobinopathy or an inherited bone marrow failure syndrome.
†This includes mortality associated with extreme prematurity and haemolytic disease of the newborn.
‡All cases of nutritional anaemia were confirmed by testing ferritin and/or iron levels, folate and B12.

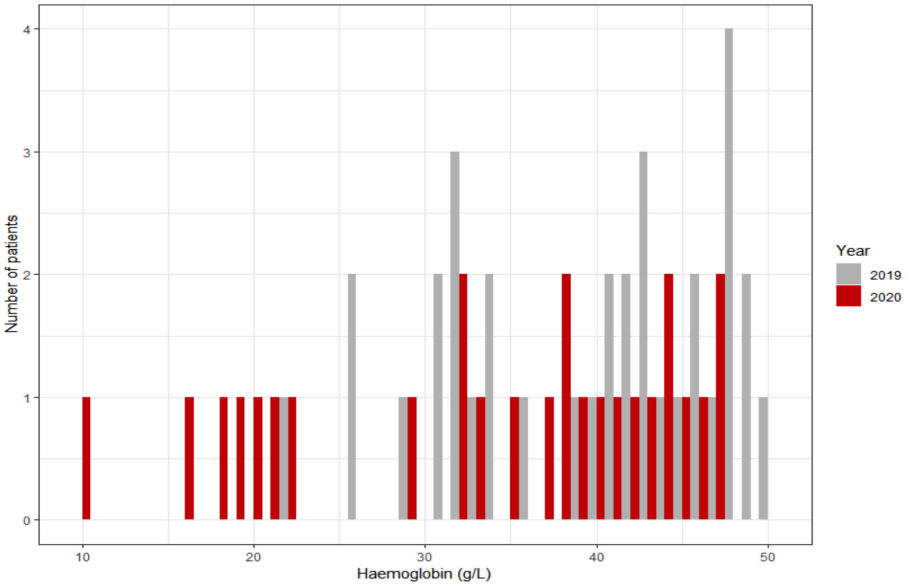

Figure 1 Distribution of cases of severe NA by haemoglobin level at presentation. NA, nutritional anaemia.

Table 2 Characteristics of children with severe nutritional anaemia 2019–2020 inclusive

		2019	2020	Total	Statistical significance p value
Total cases		34 (57)	26 (43)	60	
Age (years)	Mean	4.0	4.7	4.3	0.594
	Median	2.9	2.3	2.5	
Sex, n (%)	Female	21 (62)	13 (50)	34 (57)	0.371
	Male	13 (38)	13 (50)	26 (43)	
Presentation, n (%)	Community*	12 (35)	4 (15)	16 (27)	0.087
	Emergency†	8 (23)	12 (46)	20 (33)	0.067
	Paediatrics‡	6 (18)	3 (12)	9 (15)	0.520
	Other specialty§	2 (6)	1 (4)	3 (5)	0.725
	Incidental¶	2 (6)	2 (8)	4 (7)	0.785
	Other**	4 (12)	4 (15)	8 (13)	0.689
Duration of symptoms, n (%)	<1 month	8 (24)	3 (12)	11 (18)	0.241
	1–3 months	23 (68)	15 (58)	38 (64)	0.436
	>3 months	3 (8)	8 (30)	11 (18)	**0.030**
Haemoglobin, n (%)	Mean (g/L) range (g/L)	40 22–50 (28)	33 10–47 (37)	37 10–50 (40)	**0.024**
Distribution of haemoglobin, n (%)	41–50 (g/L)	19 (56)	9 (35)	28 (47)	0.105
	31–40 (g/L)	11 (32)	9 (35)	20 (33)	0.857
	≤30	4 (12)	8 (30)	12 (20)	0.070
Transfused, n (%)	Yes	10 (29)	15 (58)	25 (42)	**0.028**
	No	24 (71)	11 (42)	35 (58)	

Where p<0.05 this is shown in bold type.
*This includes children seen by a general practitioner who has then requested blood tests.
†This includes presentation via ambulance or as a walk in to the accident and emergency department, either directly or after a call to GP/111.
‡This includes children referred to general or community paediatrics.
§This includes children seen in a specialty paediatric clinic.
¶This includes children noticed to be pale when they were not the subject of a consultation or when seen by a pharmacist.
**This group was picked up on blood tests, but the reason for these being sent and the origin was not clear.

experienced a longer period of lockdown restrictions than many other parts of the country. Moreover, the population already had high deprivation scores.[4] It is possible, therefore, that an increase in critical NA might manifest earlier in our region compared with other regions. We recommend that this is reviewed urgently at a national level. It is essential that health professionals respond promptly and recognise the potential for NA because asking children to stay at home, and therefore out of sight, may be actively harmful for these vulnerable members of our community.

Kate Parmenter,[1] Andrew Brookes,[2] Sarah Burn,[3] Emma Gamwell,[2] Peter Jenkins,[4] Maria McPhee,[5] Sarah Webb,[6] Rajeeva Singh,[7] Sal Uka,[5] Beki James [8]

[1]Department of Neonatology, Leeds Teaching Hospitals NHS Trust, Leeds, UK
[2]Department of Paediatrics, Leeds Teaching Hospitals NHS Trust, Leeds, UK
[3]Department of Paediatrics, York District General Hospital, York, UK
[4]Department of Paediatrics, Pinderfields General Hospital, Leeds, UK
[5]Department of Paediatrics, Calderdale and Huddersfield NHS Foundation Trust, Huddersfield, UK
[6]Department of Paediatrics, Bradford Royal Infirmary, Bradford, UK
[7]Department of Paediatrics, Mid Yorkshire Hospitals NHS Trust, Wakefield, UK
[8]Regional Centre for Paediatric Haematology and Oncology, Leeds General Infirmary, Leeds, UK

Correspondence to Dr Beki James, Regional Centre for Paediatric Haematology and Oncology, Leeds General Infirmary, Leeds, West Yorkshire, UK; beki.james@nhs.net

Acknowledgements With special thanks and accreditation to the laboratory scientists, paediatricians, haematologists and informatics teams, without whom these data could not have been collected, especially in such busy times: Bradford & Airedale Hospital Trusts: Nadine Boczkowski (head of business antelligence) and Mohammed Moosa (principal business intelligence analyst); Calderdale Royal Hospital: Damon Sykes (pathology IT officer) and Jonathan Bray (senior biochemical scientist and digital health manager); Harrogate District Hospital: Charles Flouri (pathology IT manager); Hull University Teaching Hospital: Drs Ashwini Kotwal and Andrew Fletcher (consultant haematologist) and Nicola Svenson (principal clinical scientist); Leeds Teaching Hospitals NHS Trust: Liz Evans, Victoria Gore and The Business Analyst team at the Data Warehouse Leeds; Pinderfields General Hospital – Julia Halpin (chief biochemical scientist); York & Scarborough General Hospitals: Dr Laura Munro (consultant haematologist) and Richard Adams (haematology operational manager).

Contributors BJ, KP and SU initiated the project. AB, SB, EG, BJ, PJ, MM, SW and RS collected data. KP collated the data and coordinated many revisions. EG kept order with minutes from all our meetings. MM provided statistical support. AB, SB, EG, BJ, PJ, MM, SW, RS and SU all contributed to the writing.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient consent for publication Not required.

Provenance and peer review Not commissioned; internally peer reviewed.

To cite Parmenter K, Brookes A, Burn S, *et al*. *Arch Dis Child* Epub ahead of print: [*please include* Day Month Year]. doi:10.1136/archdischild-2021-322217

Accepted 2 July 2021

Arch Dis Child 2021;**0**:1–2. doi:10.1136/archdischild-2021-322217

ORCID iD
Beki James http://orcid.org/0000-0002-0558-8638

REFERENCES

1 The Department of Health. Healthy child programme. pregnancy and the first five years of life. Available: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/167998/Health_Child_Programme.pdf [Accessed 6 Feb 2021].
2 Institute of Health Visiting. Excellence in practice. Available: https://ihv.org.uk/wp-content/uploads/2020/12/State-of-Health-Visiting-survey-2020-FINAL-VERSION-18.12.20.pdf [Accessed 6 Feb 2021].
3 The IFS Deaton Review.. COVID-19 and inequalities. Available: https://www.ifs.org.uk/inequality/wp-content/uploads/2020/06/Covid-19-and-inequalities-IFS-1.pdf [Accessed 6 Feb 2021].
4 Strategic Review of Health Inequalities in England post-2010. Fair society, healthier lives: the Marmot review, 2010. Available: http://www.instituteofhealthequity.org/resources-reports/fair-society-healthy-lives-the-marmot-review/fair-society-healthy-lives-the-marmot-review-full-report.pdf