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# Original Article

# Six Strategies for Optimizing Linear Growth through Improving Awareness of Breastfeeding, Dietary Diversity in Complementary Feeding, and Growth Monitoring during Early Life

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# ABSTRACT

Only one-fourth of the countries under the Sustainable Development Goal are 'on track' to reduce the burden of malnutrition as of 2020. A deficit in linear growth during the first 5 years of life is mainly due to growth faltering in the first 1000 days. This deficit has been consistently reported to be linked to suboptimal cognitive neurodevelopment, while its improvement in early childhood has been reported to offer an opportunity for rescuing neurocognitive potential. This paper describes the perspectives of multidisciplinary experts, representing a range of disciplines related to child growth and nutrition, from Nigeria, Indonesia, and Malaysia, who convened virtually to review and discuss measures aimed at preventing a further increase in growth faltering, including stunting, among children aged 0-3 years under the current prevailing circumstances. Based on the latest evidence of practices and knowledge, the expert panel proposed six strategies to support linear growth in early life which consists of 2 new initiatives: 1) increasing peer-to-peer knowledge transfer among HCP via digital engagement; 2) increasing knowledge transfer from HCPs to caregivers via social media; while maintaining the existing strategies: 1) stimulating initiatives to support breastfeeding during the first 6 months of life; 2) improving quality of complementary feeding; 3) strengthening growth monitoring to detect suboptimal growth in early childhood; 4) optimizing public-private engagement. The recommended solutions presented herein are the culmination of the collective insights of the expert panel. These recommendations offer invaluable approaches on addressing the critical public health issue of malnutrition, specifically growth faltering, and can benefit not only the three countries concerned but also other low and middle-income countries facing similar nutritional challenges.

Keywords: dietary diversity, complementary food, linear growth, growth monitoring, early life

### INTRODUCTION

The prevalence of malnutrition including stunting, wasting, underweight, overweight and obesity of young children is concerning. In 2020, stunting, wasting and obesity were affecting about 149 million (22%) and 45.2 million (6.7%) and 38.9 millions of children under age of five years, respectively [1]. The 65th World Health Assembly (WHA) in 2012 endorsed a Comprehensive Implementation Plan on Maternal, Infant, and Young Child Nutrition with the goals of reducing stunting and wasting in children under 5 years, halting the epidemic of obesity, reducing low birth weight, and increasing the rate of exclusive breastfeeding. These targets were then integrated into the 2015 agenda of the Sustainable Development Goals (SDGs) 2 on Zero Hunger with the aim to end all forms of malnutrition by 2030 [2]. However, only one-fourth of the countries are considered to be on track to achieving SDG-2 goal of reducing the burden of stunting, wasting, or overweight by 2030 [2]

Linear growth faltering is defined as falling below the height-for-age trajectory based on the World Health Organization (WHO) child growth standards [3] Linear growth faltering is associated with delayed child development, which leads to poor performance and underachievement at school, compromised physical strength and work capacity. In addition, growth faltering also influences several cognitive functions, including attention span, problem solving, mathematics and language skills of young children [4].

Linear growth faltering mostly (70%) occurs during the first 1,000 days of children's lives however, 30% of faltering is attributed to the accumulated deficits from age two to five years [5]. Importantly, this catch-up in linear growth should occur before the age of 8 years as this period offers a window of opportunity for children's brain development to partly overcome the deficits and attain closer to their cognitive potential [4]

Nutrition has been widely recognized to directly influence growth and cognitive development during the first few years of life [3] Without appropriate nutrition intervention, improvement in, amongst others, linear growth is difficult to achieve [4,5].Breastfeeding practice is important to protect infant from infections and lower the risk of obesity and mortality in children[1]. In addition to optimal breastfeeding, high-quality complementary food and appropriate feeding practices are critical for children's growth and development. However, these practices are reported to be considerably suboptimal in certain populations, such as in Asia Pacific [6,7]

Several indicators have been developed to assess the quality of complementary food such as the minimum dietary diversity (MDD), minimum meal frequency (MMF) and minimum acceptable diet (MAD) [8]. The minimum dietary diversity (MDD) indicator is achieved when a child aged 6-23 months consumed foods and beverages from at least five out of eight defined food groups in the previous day [8]. Minimum meal frequency (MMF) is obtained when children 6-23 months of age consumed solid, semi-solid or soft foods (including milk feeds for non-breastfed children) at least the minimum number of times during the previous day [8] . Breastfed children are deemed to have a minimum acceptable diet (MAD) if they received at least the MDD and MMF for their age the previous day; while non-breastfed children are considered to have MAD if they received at least the MDD and MMF for their age plus at least two milk feeds in the previous day [8]

Many countries, even before the COVID-19 pandemic, are not likely to achieve SDG-2 within the specified time frame [9]Therefore, it was deemed important to assess the current situation, review scientific evidence, and obtain clinical critical feedback on strategies for optimizing growth, particularly linear growth, among young children.

### **METHODOLOGY**

Seventeen multi-disciplinary healthcare practitioners (HCPs)/experts from multidisciplinary backgrounds, including pediatrics, family medicine, nutrition science, and psychology, from Indonesia, Nigeria and Malaysia with a total of more than 100 man-year experience, held three country-specific meetings in 2021. Each meeting was held for half a day via the digital platform MS Teams and MURAL<sup>TM</sup> to discuss, brainstorm and quantify the importance of some key actions to

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further support children's growth and nutrition, especially in prevention of faltering (linear) growth. Key questions discussed in the meetings are: 1) Review the scientific evidence and obtain clinical opinion on the role of milk in supporting optimal growth and preventing faltering and stunting among children aged 0–3 years, 2) Discuss trends in dietary intake, nutrition and growth-related issues among children aged 0-3 years in Malaysia, Nigeria and Indonesia, 3) Discuss effective approaches in the of knowledge among transfer healthcare professionals (HCPs), and from HCPs to mothers on the role of milk in supporting optimal growth. There was no specific criteria for adoption of strategies and subsequent agreement.

The aim of this paper is to share the two new strategies and to further strengthen four existing

strategies that this group agreed upon to support children's linear growth and improve their dietary intake and nutritional status. These strategies can also benefit other countries facing similar predicament. The recommendations still hold true today as the delivery of childcare services continues to be constrained.

### RESULTS

The expert meetings have put forward a set of six multi-disciplinary strategies aimed at preventing (linear) growth faltering in young children. They consist of 2 new strategies and 4 strategies to support existing ones. The new strategies are:

	Nigeria	Indonesia	Malaysia
Internet and smart phone penetration			
Internet penetration (% population)	51.0	73.7	89.6
Mobile connections (% population)	82.4	133.3*	127.7*
Use of social media (% population)	15.4	68.9	91.7
Facebook users (% internet users)	23.9	60.0	82.4
TikTok users (% internet users)	Data not available	47.6	61.2

Table 1 Digital Penetration by Countries<sup>11</sup>

\*A segment of the population has multiple mobile connections.

### 1) Increasing HCP engagements on peer-to-peer knowledge transfer via digital and non-digital approaches

Increasing the awareness of HCPs on the importance of monitoring linear growth and providing timely nutritional interventions to prevent growth faltering can help realize the United Nations' Sustainable Developmental Goal (SDG)-2 target to end all forms of malnutrition by 2030 [2] As face-to-face physical interactions were limited during the COVID-19 pandemic, virtual communication via digital technology was used to ensure that HCPs could share knowledge and information on nutrition and growth. Digital communication channels can be used in combination with small face-to-face group discussion post- pandemic [10]. Videos, webinars, or emails have been reported to support the educational activities of HCPs in various settings.

Table 1 shows the accessibility to the internet and digital tools of usage in Nigeria, Indonesia and Malaysia. With the increasing availability of relevant online learning and training materials [10] the continued use of digital tools should be further explored.

# 2) Increasing transfer of knowledge from HCPs to mothers/parents/caregivers via social media channels

HCPs play a central role in sharing knowledge with mothers, parents, and caregivers [12] Studies in the Netherlands clearly demonstrated the positive impact of HCPs's involvement in a program called

"Solid Start the Action Program" in strengthening the intertwined between healthcare practitioners, government policymakers and community [13]. Different countries face unalike challenges in conveying the right information to non-HCPs. For example, in Indonesia. misinformation on social media is a major hurdle in communicating correct information to mothers and caregivers While the most challenging issue faced by mothers in Nigeria is pressure from peers and elders related to childcare and feeding practices. Thus, identifying solutions and preparing effective and tailored interventions could help HCPs to counter the widespread presence of health-related misinformation [14]

Table 2. Communication channels to increase awareness among HCPs and to promote nutritional education among mothers/parents/caregivers discussed during the meetings.

	Nigeria	Indonesia	Malaysia
For HCPs			
Non-digital			
Face-to-face continuing medical	х	x	Х
education (CME)-accredited modules			
Publication in respectable journals	х		
One-to-one interaction	х		Х
Printed pamphlets in infographic style			Х
for HCPs			
Digital			
Sending regular emails			Х
Sharing information via social media on		х	
Facebook, Instagram, YouTube, Twitter,			
and TikTok			
Circulating e-pamphlets in social media		х	Х
through WhatsApp			
Webinars	х	х	Х
For mothers/parents/caregivers/			
Engaging social media content and		х	Х
channel			
Mass media (e.g., television/radio	х	х	Х
program)			
Via public support and religious groups	х	x	
Group discussions	х		

Several strategies using mass communication channels to overcome the hurdles in sharing knowledge with mothers/parents/caregivers are listed in Table 2.

The other 4 strategies to support existing approaches are:

### 1) Stimulating initiatives to support breastfeeding during the first six months of life

On average, globally only 44% of infants 0–6 months of age received exclusive breastfeeding in 2021 [1] According to the 2018 Demographic and Health Survey (DHS), only 29% infants were still exclusively breastfed at 6 months of age in Nigeria [15]. In Indonesia, this was about 42% of infants [16] . Malaysia National Health and Morbidity Survey 2016 reported that almost half of infant (47%) in Malaysia are exclusively breastfed at 6 months of age [17]

Breast milk adapts its nutritional composition to the changing needs of a growing infant and its macro- and micronutrients are generally sufficient to meet all the nutritional requirements of infants up to 6 months of age.[1]. According to a Cochrane review, deficits in growth are less likely in infants who have been exclusively breastfed for six months, and these infants have a lower propensity for gastrointestinal infections [6]Breastfed infants have lower risk to be overweight or obese, and have better cognitive development in later life [1]

Stimulating actions to support breastfeeding during the first six months of life will ensure every infant has a good start in life and prevent infection and reduce mortality in later life Some strategies include [1,6]. effectively implementing and continuously monitoring breastfeeding promotion in hospitals and community clinics. Actions such as establishing and monitoring Baby-friendly hospitals, providing breastfeeding education during pregnancy, and increasing health professional counseling before and after childbirth, are integral components of programs aimed at improving breastfeeding practices. Increasing family or community support such as via community mobile clinics and trained home visitors programs are also important to provide a safe and suitable environment to engage mothers in breastfeeding practices [1]

# 2) Improving the quality of complementary feeding in older infants

In 2020, UNICEF reported that on average, only 55%, 28%, and 18% of children aged 6–23 months old from low- and middle-income countries (LMICs) met the MDD, MMF, and MAD recommendations, respectively [18]The reported quality of complementary feeding in Nigeria, for example, is relatively poor, compared to the quality of complementary feeding in Indonesia and Malaysia (MDD: 22.6% vs. 58.2% vs. 66.4%; and MMF: 41.9% vs. 71.7% vs. 80.8%; MAD: 10.6% vs. 40.3% vs. 53.1% in Nigeria, Indonesia, and Malaysia, respectively) [18]

To improve the nutritional status of infants and children, it is critical to have high-quality complementary foods with adequate energy, highquality protein, and micronutrients. Infants and young children's diet must be sufficiently sourced from animals, which includes fish and dairy products, and also adequate intake of pulses, fruits and green leafy and orange-colored vegetables, healthy fats and oils [7].

In observational population-based studies, high-quality proteins were recommended as they provide large quantities of easily accessible essential amino acids (histidine, lysine, threonine, valine, leucine, isoleucine, methionine, phenylalanine, tryptophan), and conditionally essential amino acids (e.g., arginine), in addition to the non-essential amino acids [19]These amino acids promote age-appropriate linear growth by stimulating insulin-like growth factor 1 and growth hormones via the mechanistic target of rapamycin complex (mTORC1) [19]. Animal-based proteins are a rich source of essential amino acids [19]. Therefore, it is important to recommend the

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inclusion of nutrient-dense animal source foods in the complementary feeding of children aged 6 to 23 months, especially among those with suboptimal growth [19]

Vitamin D and iron deficiencies have been reported to be highly prevalent among children 1-5 years of age [20]. The APACPH Public Health Nutrition Group guidelines recommend adequate intake of micronutrients through the consumption of fortified or iron-rich foods to improve iron deficiency status among young children [7]. Safe sun exposure, and the consumption of vitamin D fortified foods or oral vitamin D supplementation are important preventive actions to reduce vitamin D deficiency in children [19]A study conducted among Irish children aged 12 to 24 months showed fortified young child formula (YCF) could reduce the risk of inadequacies of iron and vitamin D, compared to unfortified cow's milk [21]

### 3) Strengthening anthropometric growth monitoring and communicating the results to caregivers for early detection suboptimal growth during childhood

Anthropometric indicators (weight, length, and head circumference) must be regularly measured, plotted, and interpreted using suitable child growth charts. This practice of growth monitoring is defined as "a process of following the growth of a child compared with a growth standard by periodic, frequent anthropometric measurements and assessments" [22]. The implementation of a growth monitoring program will need to consider local socioeconomic and cultural contexts, which can help to engage HCP and community [22]. Effective growth monitoring can aid in early detection of growth faltering, reduce delay in diagnosing its adverse outcomes, and improve its prognosis [23]

There is scant data available on growth monitoring and interpretation practices in Nigeria, Indonesia, and Malaysia. In South Africa and Zimbabwe, almost all infants were weighed; however, only around 70% of the registered weights were 'plotted', and only 50% were 'well-interpreted' [23,24]The barriers to effective growth monitoring include high patient volume, lack of proper measuring equipment, and the inability to interpret data accurately [23,24]Therefore, it is important to implement effective growth monitoring and interpretation programs in communities, clinics and hospital settings.

### 4) Optimizing public-private partnerships (PPP)

Public-private partnerships (PPP) involve partnering with government agencies, universities, professional organizations, food industries, and/or community groups for more sustainable efforts to reach out to the wider community and to strengthen trust among stakeholders The United for Healthier Kids movement in the United Kingdom [25] and the micronutrient fortification voluntary of commercially available biscuits in Cameroon [26] are some examples of successful PPPs.

Other types of initiatives that can be fostered through PPPs: 1) organizing workshops in collaboration with the Ministry of Health; 2) providing high-quality food products or milk as part of existing Food Basket Programs for families with young children; and 3) improving access to nutritious food by having affordable YCF for children older than one year of age. Each country needs to select the right partners to foster PPPs to overcome specific health/nutritional issues in their respective country.

Even though the strategies are not based on a Delphi method, which is the golden standard for developing a consensus [27], these six strategies recommended by experts could still be further adjusted depending on the level of resources available in specific countries. They can be applied also in other countries facing similar health issues to improve the growth and development trajectories of young children.

# CONCLUSION

Based on current evidence, practices, and professional experience, a multi-disciplinary team of HCPs/experts formulated six strategies to prevent (linear) growth faltering in early life. These six strategies consists of 2 new ones: 1) increase HCP engagements on peer-to-peer knowledge transfer via digital and non-digital approaches, 2) increase transfer of knowledge from **HCPs** to mothers/parents/caregivers via social media channels, and 4 strategies to support existing approaches: 1) stimulating initiatives to support breastfeeding during the first 6 months of life, 2) improvement of quality of complementary feeding in older infants, 3) strengthening anthropometric growth monitoring to detect suboptimal growth in early childhood, 4) further optimizing of PPP. These strategies will remain pertinent and valuable in the post-pandemic landscape, and it can benefit not only the three countries concerned, but also offer invaluable approaches to other low and middle-

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income countries facing similar nutritional challenges.

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### **Authors' Contribution**

MYJ, BKP, CJ, AS, JMWG, UK, LM initiated the Expert discussion and framework of the paper. MYJ, PBK, CJ provided extensive comments on the drafts. LM and STL finalized the manuscript. All authors contributed to the development and agreed on the final version of the manuscript.

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### **Conflict of interest**

JMWG, UK, LM are FrieslandCampina employees at the development and submission of the manuscript.

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