EFFICACY OF MICRONUTRIENTS POWDER SUPPLEMENTATION ON GROWTH AND IRON STATUS OF ORANG ASLI CHILDREN IN SELANGOR, MALAYSIA

By

NUR DAYANA SHAARI

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Doctor of Philosophy

March 2022

FPSK (p) 2022 53

COPYRIGHT

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Doctor of Philosophy

EFFICACY OF MICRONUTRIENTS POWDER SUPPLEMENTATION ON GROWTH AND IRON STATUS OF ORANG ASLI CHILDREN IN SELANGOR, MALAYSIA

By

NUR DAYANA SHAARI

March 2022

Chairman : Professor Zalilah Mohd Shariff, PhD
Faculty : Medicine and Health Sciences

In Malaysia, the prevalence of undernutrition and anaemia in Orang Asli (OA) children under five are relatively higher than the general population, even though many strategies have been implemented. The effect of micronutrients powder (MNP) has been indicated as a recuperative, but not a preventive strategy of child undernutrition. MNP was developed and formulated by World Health Organisation (WHO) and produced by DSM Nutritional Products in Selangor. To date, MNP is not commercially available in market. This study aimed to determine the effect of MNP (containing 15 micronutrients) on growth, iron status and dietary intakes as a prevention of underweight, stunting, wasting and anaemia among OA children with normal nutritional status (normal in weight-for-age/ WAZ, length-for-age/ LAZ, weight-for-length/ WLZ and haemoglobin level) at baseline. In phase one, a feasibility study was conducted among 25 OA children aged 6-31 months in Negeri Sembilan to determine the MNP compliance, acceptance, preference, and adverse effect. The children received three MNP sachets weekly for 5 weeks. In phase two, a cluster randomised controlled trial was conducted with 98 children aged 6-24 months from OA villages in Selangor. The children were assigned randomly into two groups: 49 children in intervention group received three MNP sachets weekly for 12 months plus health and nutrition advice, while 49 children in control group received health and nutrition advice. Growth (weight, length, WAZ, LAZ, WLZ) and iron status (haemoglobin) were the primary outcomes, while dietary intake (energy, nutrients, food group) was the secondary outcomes. Analysis for the feasibility study was based on descriptive statistics, whereas ANCOVA using General Linear Model (GLM) for repeated measures was performed in the trial (per protocol analysis). The findings of the feasibility study showed a high compliance, no adverse effect and no changes in foods mixed with MNP. During the trial, 43 and 44 children remained in intervention and control group, respectively. For the trial, the results were presented in 3 models. Model A controlled for age and gender, Model B controlled for age, gender and proportion of children meeting iron recommendation at baseline, and Model C controlled for age, gender, proportion of children meeting iron recommendation and %

energy from protein at baseline. The results revealed length and LAZ were significantly different between groups (in Model A and B, but none in Model C). Other indicators such as weight, WAZ, WLZ, haemoglobin and dietary intakes were not significantly different. The rate of stunting in control group was significantly five times higher than intervention group at month 12. In conclusion, the feasibility study revealed that MNP was feasible for a randomised controlled trial among OA children in Selangor. The randomised controlled trial in Selangor confirmed that MNP given three times weekly for 12 months and provided with health and nutrition advice can improve length, LAZ and prevent stunting among OA children but no impact on weight and haemoglobin. However, future studies with diverse sub-tribes of OA would provide more information on the effect of MNP on growth, iron status and dietary intake of children.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

KEBERKESANAN SUPLEMEN SERBUK MIKRONUTRIEN TERHADAP STATUS TUMBESARAN DAN ZAT BESI DALAM KALANGAN KANAK-KANAK ORANG ASLI DI SELANGOR, MALAYSIA

Oleh

NUR DAYANA SHAARI

Mac 2022

Pengerusi : Profesor Zalilah Mohd Shariff, PhD
Fakulti : Perubatan dan Sains Kesihatan

Prevalens kekurangan zat makanan dan anemia dalam kalangan kanak-kanak Orang Asli (OA) berusia bawah 5 tahun adalah lebih tinggi dari populasi umum di Malaysia walaupun pelbagai strategi telah dilaksanakan. Kesan suplemen serbuk mikronutrien (MNP) telah banyak ditunjukkan sebagai strategi penyembuhan kepada kekurangan zat makanan kalangan kanak-kanak, dan bukan sebagai strategi pencegahan. MNP telah dibentuk dan diformulasikan oleh Pertubuhan Kesihatan Sedunia (WHO) dan dikeluarkan oleh DSM Nutritional Products di Selangor. Hingga kini MNP tiada di pasaran bagi tujuan komersial. Kajian ini bertujuan untuk menentukan kesan MNP (mengandungi 15 mikronutrien) terhadap status tumbesaran, zat besi dan pengambilan diet sebagai pencegahan kepada kekurangan berat badan, terbantut, susut dan anemia dalam kalangan kanak-kanak OA yang mempunyai status pemakanan (berat-untuk-umur/ WAZ, panjang-untuk-umur/ LAZ, berat-untuk-panjang/ WLZ dan paras hemoglobin) yang normal di awal kajian. Dalam fasa pertama, kajian kebolehlaksanaan telah dijalankan melibatkan 25 orang kanak-kanak OA berumur 6-31 bulan di Negeri Sembilan, dan ia bertujuan untuk menentukan kepatuhan, penerimaan, pilihan, dan kesan buruk MNP. Kanak-kanak tersebut telah menerima tiga bungkusan MNP setiap minggu dalam tempoh lima minggu. Dalam fasa kedua, ujian kluster rawak terkawal telah dijalankan melibatkan seramai 98 orang kanak-kanak berusia 6-24 bulan daripada perkampungan OA di Selangor. Kanak-kanak tersebut telah diasingkan secara rawak kepada dua kumpulan: 49 orang kanak-kanak dalam kumpulan intervensi menerima tiga bungkusan MNP setiap minggu dalam tempoh 12 bulan serta nasihat kesihatan dan pemakanan, manakala 49 orang kanak-kanak dalam kumpulan kawalan menerima nasihat kesihatan dan pemakanan. Status tumbesaran (berat, panjang, WAZ, LAZ, WLZ), dan status zat besi (hemoglobin) adalah kesan utama yang dikaji, manakala pengambilan diet (tenaga, nutrien, kumpulan makanan) adalah kesan kedua yang dikaji. Analisa bagi kajian kebolehlaksanaan adalah berdasarkan statistik deskriptif, manakala ANCOVA menggunakan General Linear Model (GLM) untuk ukuran berulang telah dijalankan untuk ujian kluster rawak terkawal (analisa per protokol). Hasil kajian

kebolehlaksanaan menunjukkan tinggi kepatuhan, tiada kesan sampingan dan tiada perubahan dalam makanan yang dicampurkan dengan MNP. Semasa ujian kluster rawak terkawal dijalankan, seramai 43 dan 44 orang kanak-kanak masing-masing kekal dalam kumpulan intervensi dan kawalan. Bagi ujian kluster rawak terkawal, keputusan telah disampaikan dalam tiga model. Model A mengawal umur dan jantina, Model B mengawal umur, jantina dan proporsi kanak-kanak yang memenuhi saranan pengambilan zat besi di awal kajian, dan Model C mengawal umur, jantina, proporsi kanak-kanak yang memenuhi saranan pengambilan zat besi dan peratusan tenaga daripada protein di awal kajian. Keputusan menunjukkan panjang dan LAZ adalah berbeza secara signifikan antara kumpulan (bagi Model A dan B, tetapi tidak bagi Model C). Indikator lain seperti berat, WAZ, WLZ, hemoglobin dan pengambilan diet adalah tidak berbeza secara signifikan. Kadar terbantut dalam kumpulan kawalan adalah lima kali lebih tinggi daripada kumpulan intervensi secara signifikan pada bulan ke-12. Tiada kesan MNP didapati terhadap status zat besi, dan pengambilan makanan. Kesimpulannya, kajian kebolehlaksanaan telah menunjukkan bahawa MNP adalah boleh dilaksanakan bagi ujian kluster rawak terkawal dalam kalangan kanak-kanak OA di Selangor. Ujian kluster rawak terkawal telah mengesahkan MNP yang diberi sebanyak tiga kali seminggu dalam tempoh 12 bulan bersama nasihat kesihatan dan pemakanan dapat meningkatkan panjang, LAZ dan mencegah masalah terbantut dalam kalangan kanak-kanak OA, namun tiada kesan terhadap berat dan haemoglobin. Walaubagaimanapun, kajian yang melibatkan OA dengan kepelbagaian etnik pada masa akan datang dapat memberikan hasil kajian yang lebih jelas dan memberi lebih maklumat mengenai kesan MNP terhadap status tumbesaran, zat besi dan pengambilan diet kanak-kanak.

ACKNOWLEDGEMENTS

First and foremost, all praise to Allah SWT for the strengths and His blessing in completing this work.

My highest appreciation is given to my supervisor Professor Dr. Zalilah Mohd Shariff for her consistent coaching, expertise, valuable suggestion and tremendous support throughout the period of the study. I would like to thank Associate Prof. Dr. Loh Su Peng and Associate Prof. Dr. Gan Wan Ying as members of my supervisory committee for the guidance, views, and comments at various stages of the study.

My appreciation also to my beloved parents Allahyarham Haji Shaari Yusoff, Hajah Roslina Tan and siblings for the prayer, advice, and support during my study. My special thanks to my lovely soulmate Mohd Solehan Haji Ahmad Shah and to my adorable children Syahadah, Sofi, Sakinah and Yusuf for the love, funds, sacrifice, support and patience. Ummi love you forever till Jannah.

Last but not least, thanks to all my friends Rozalina, Sulhariza, Dr Liyana, Dr Heng Yaw, Dr Baizura, my helpful enumerators and many more for the prayers and supports throughout my journey. Without all of you, I would not have had such a positive and fulfilling experience.

"May Allah blessed all of you with the best rewards, ameen"

This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfillment of the requirement for the degree of Doctor of Philosophy. The members of the Supervisory Committee were as follows:

Zalilah Mohd Shariff, PhD
Professor
Faculty of Medicine and Health Sciences
Universiti Putra Malaysia
(Chairman)

Loh Su Peng, PhD
Professor
Faculty of Medicine and Health Sciences
Universiti Putra Malaysia
(Member)

Gan Wan Ying, PhD
Associate Professor
Faculty of Medicine and Health Sciences
Universiti Putra Malaysia
(Member)

ZALILAH MOHD SHARIFF, PhD
Professor and Dean
School of Graduate Studies
Universiti Putra Malaysia

Date: 13 April 2023

Declaration by the Graduate Student

I hereby confirm that:

- this thesis is my original work;
- quotations, illustrations and citations have been duly referenced;
- this thesis has not been submitted previously or concurrently for any other degree at any institutions;
- intellectual property from the thesis and copyright of thesis are fully-owned by Universiti Putra Malaysia, as according to the Universiti Putra Malaysia (Research) Rules 2012;
- written permission must be obtained from supervisor and the office of Deputy Vice-Chancellor (Research and innovation) before thesis is published (in the form of written, printed or in electronic form) including books, journals, modules, proceedings, popular writings, seminar papers, manuscripts, posters, reports, lecture notes, learning modules or any other materials as stated in the Universiti Putra Malaysia (Research) Rules 2012;
- there is no plagiarism or data falsification/fabrication in the thesis, and scholarly integrity is upheld as according to the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013) and the Universiti Putra Malaysia (Research) Rules 2012. The thesis has undergone plagiarism detection software

Signature: _____ Date: _____

Name and Matric No: Nur Dayana Shaari

Declaration by Members of the Supervisory Committee

This is to confirm that:

- the research conducted and the writing of this thesis was under our supervision;
- supervision responsibilities as stated in the Universiti Putra Malaysia (Graduate Studies) Rules 2003 (Revision 2012-2013) are adhered to.

Signature: _____

Name of Chairman of Supervisory Committee: Professor Dr. Zalilah Mohd Shariff

Signature: _____

Name of Member of Supervisory Committee: Professor Dr. Loh Su Peng

Signature: _____

Name of Member of Supervisory Committee: Associate Professor Dr. Gan Wan Ying

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ABBREVIATIONS

ANOVA	Analysis of Variance
ANCOVA	Analysis of Covariance
AOR	Adjusted Odd Ratio
BMR	Basal Metabolic Rate
CG	Control group
cm	Centimeter
CONSORT	Consolidated Standards of Reporting Trials
CRF	Case Report Form
CI	Confidence Interval
d/ L	Deciliter
EI	Energy intake
EPU	Economic Planning Unit
FAO	Food and Agriculture Organization of the United States
FPSK	Fakulti Perubatan dan Sains Kesihatan
g	Gram
GLM	General Linear Model
HAZ	Height-for-age z score
Hb	Haemoglobin
IASG	United Nations Inter-Agency Support Group
ICC	Intracluster Correlation Coefficient
IG	Intervention group
IWGIA	International Work Group for Indigenous Affairs
IYCF	Infant and Young Child Feeding

JAKOA	Jabatan Kemajuan Orang Asli
JKEUPM	Jabatan Etika Penyelidikan Melibatkan Manusia Universiti Putra Malaysia
Kcal	Kilocalorie
kg	Kilogram
LAZ	Length-for-age z score
L	Liter
Mg	Milligram
MNP	Micronutrients Powder
MOH	Ministry of Health
NCCFN	National Coordinating Committee on Food and Nutrition
NHMS	National Health and Morbidity Survey
OA	Orang Asli
PhD	Philosophy of Doctorate
RCT	Randomised controlled trial
RDA	Recommended Dietary Allowance
RE	Retinol Equivalent
RNI	Recommended Nutrient Intake
SD	Standard deviation
SPSS	Statistical Package for Social Sciences
STH	Soil-Transmitted Helminths
UNICEF	United Nations Children's Fund
WAZ	Weight-for-age z score
WFP	World Food Program
WHO	World Health Organization

WLZ	Weight-for-length z score
µg	Microgram

CHAPTER 1

INTRODUCTION

1.1 Background

Nutrition has a major impact on early child growth and development. Child undernutrition is largely attributed to inadequate nutrition and infectious diseases. Undernutrition is a condition resulting when a person's diet does not provide adequate nutrients for growth and maintenance or when a person is not able to adequately utilise the food consumed due to illness (UNICEF, 2009). During early childhood, undernutrition defined as underweight, stunting, wasting or micronutrient deficiencies, could have short term adverse effects on child cognitive and motor development, resistance to infections, morbidity and mortality, and long-term socio-economic and health consequences such as academic performance, economic productivity and risk of chronic diseases (Black et al., 2013; Victora et al., 2008).

Globally, it is estimated that 21.3% children under five are affected by stunting and 6.9% wasting (WHO, 2020). While low estimates of underweight, stunting and wasting are observed in developed countries such as Northern America (0.4%, 3.2% and 0.0%, respectively) and Australia (0.2%, 2.1% and 0.0%, respectively) (WHO, 2021), estimates of stunting and wasting in Asia are at 54% and 69%, respectively (WHO, 2020). It was reported that underweight, stunting and wasting in children under five are prevalent in developing countries such as Indonesia (17.7%, 31.8% and 10.2%, respectively), followed by Malaysia (14.1%, 20.9% and 9.7%, respectively) and Thailand (7.7%,12.3% and 7.7%, respectively) (WHO, 2021).

Micronutrient deficiency is a common disorder in undernourished children especially from low-income population (Shenton *et al*., 2020). Iron deficiency is one of the most common micronutrient deficiencies in children especially in low- and middle-income countries (WHO, 2007). Iron deficiency is the usual cause of anaemia resulted from a long-term negative iron balance due to insufficient iron intake (Moretti, 2017; Shubham *et al*., 2020; WHO, 2007). Globally, iron deficiency anaemia affects 42% of children under five (WHO, 2021). The national estimates of anaemia in children under five in developed countries such as Australia, and Canada were 13.3% and 13.2% in 2019, respectively (WHO, 2021). It was reported that about 68.9% and 53% of children under five in Nigeria and Pakistan had anaemia, respectively (WHO, 2021). Similar with other developing countries, anaemia is prevalent (24.6%) in children under five in Malaysia, particularly among the rural and poor communities (WHO, 2021).

High prevalences of child undernutrition and iron deficiency have been reported mostly among communities with high rates of poverty, low education level, high food insecurity and lack of access to healthcare services such as the indigenous peoples (Coimbra, 2013;

Horta et al., 2013; Leite et al., 2013). Indigenous peoples are those through historical processes have been underprivileged and living in preserved traditional ways with linguistic and cultural diversities (IWGIA, 2018). They live predominantly in remote and rural areas, with minority reside in urban areas (IWGIA, 2010). It is estimated that there are more than 370 million indigenous people residing in 70 countries worldwide and representing 5% of the world's population (IWGIA, 2018). In Asia, there are about 260 million or two thirds of the world's indigenous peoples (International Labour Office., 2017).

Morbidity rates are also higher in the indigenous population than the general population due to various factors such as poor resistance to infections, acute lower respiratory infection and diarrhoeal disease (Binks et al., 2020; Brito et al., 2020; Wiseman et al., 2016). According to the United Nations Inter-Agency Support Group (IASG, 2014), the prevalence of tuberculosis among indigenous population in Bolivia was five to eight times higher compared to non-indigenous population while the indigenous people in Greenland were 45 times more likely to get active tuberculosis than the Danish population. Moreover, the same report mentioned that infant mortality rate among indigenous children in Latin America was 60 percent higher (48 per 1000 infants) than for non-indigenous children (30 per 1000 infants), ranging from 1.11 times higher in Chile to 3.09 times higher than the general population in Panama. Additionally, the prevalence of chronic diseases was alarmingly high among indigenous peoples worldwide even though undernutrition remains as the main health problem among indigenous peoples as reported by many studies (Burnette et al., 2020; IASG, 2014; Sullivan et al., 2020).

Globally, the prevalence of child undernutrition is much higher in the indigenous children than the general population. In Australia, 8% of indigenous children under five years are underweight (Sjoholm et al., 2020) compared to 4.8% of underweight children in the general population. Pereira et al. (2017) reported that the prevalence of underweight and stunting were substantially greater among indigenous children under five years in Brazil (4.4% and 20.2%) than those observed in Brazilian children nationally (2.9% and 10%). The prevalences of underweight, stunting and wasting among indigenous children in India were 65.2%, 54.2% and 20.1% compared to the national level of 29%, 39% and 15%, respectively (Stiller et al., 2020).

Malaysia has an estimated 13.9% of the 31 million global population of indigenous peoples (IWGIA, 2016). The *Orang Asli* (OA) are the indigenous peoples of Peninsular Malaysia, representing 0.84% of the population in Peninsular Malaysia (~ 24.5 million). OA are usually of low socioeconomic status with poor health and nutritional status (Murtaza et al., 2018; Tunbosun et al., 2017; Zakaria et al., 2019). Malaysia, like other developing countries, has a high burden of undernutrition among the indigenous groups, particularly children. The prevalence of child undernutrition is much higher in the OA than the general population. The national prevalences of underweight, stunting and wasting among children under five were 14.1%, 21.8% and 9.7%, respectively (NHMS, 2019). Studies published since the 1980's on nutritional status of OA children have consistently reported high prevalence of underweight (31-49%), stunting (32-76%) and

wasting (4-58.5%) (Al-Mekhlafi et al., 2005; Geik and Sidek, 2015; Mas-Harithulfadhli-Agus et al., 2018; Masroor et al., 2014; Murtaza et al., 2018; Norlida et al., 2007, Wong et al., 2015; Zalilah and Tham 2002). Moreover, the prevalence of anaemia and iron deficiency anaemia are noticeably higher among OA children under 15 years (41.5% and 36.5%) than those observed for the general population (26.2% and 16.9%) (Aini et al., 2007; Murtaza et al., 2018; Ngui et al., 2011).

Many strategies have been implemented to prevent undernutrition and micronutrient deficiencies in developing countries such as food fortification and nutritional supplementation (WHO & FAO, 2006). Although food fortification can improve micronutrient status at a reasonable cost, fortified foods require well-absorbed fortificants that do not change the sensory properties of foods and need to be consumed adequately (WHO & FAO, 2006). While food supplementation can supply nutrients fast to deficient individuals, poor compliance to supplement dosing schedule and the side effects were reported as barriers to success (Cardoso et al., 2016; WHO & FAO, 2006). Evaluation of feasible and acceptable strategies to deliver multiple micronutrients is, thus, a priority (WHO, 2011).

The Nutrition Guidance Expert Advisory Group (WHO, 2011) recommends the use of micronutrients powder (MNP) as home fortification of foods consumed by infants and children aged 6 to 59 months of age to prevent child undernutrition. MNP is a blend of micronutrients in powder form that can be sprinkled onto foods prepared either at home or in any other places where meals are to be consumed (for example schools, childcare centres, refugee camps). However, the use of MNP for infants under the age of six months is not recommended, as they should be exclusively breastfed in accordance with the WHO guidelines on breastfeeding. MNP is used in situations where local diets do not provide adequate quantities of micronutrients to meet the recommended intakes. It supports caregivers to improve the quality of their family's diet by adding micronutrients to locally available foods that are prepared at home or in any other places where meals are to be consumed. MNP has been used in many intervention trials among children aged 6 to 59 months with a duration of intervention between two months to one year in developing countries such as Israel, Iran, Indonesia, Pakistan, India and Kenya (Barth-Jaeggi et al., 2015; Bilenko et al., 2010; Inayati et al., 2012; Samadpour et al., 2011; Sazawal et al., 2014; Soofi et al., 2013).

1.2 Problem Statement

The effectiveness of MNP for prevention of underweight, stunting and wasting has not been extensively studied. Many studies demonstrated MNP as a recuperative strategy rather than a preventive strategy (Barffour et al., 2019; Barth-Jaeggi et al., 2015; Hess et al., 2019; Lanou et al., 2019; Neufeld et al., 2019; Osei et al., 2015; Rana and Schellenberg, 2019; Samuel et al., 2018; Shafique et al., 2016). These randomised controlled trials targeted children below two years or five years of age who were undernourished at baseline (underweight, stunted or wasted) as recuperative strategy.

The preventive strategy may have aided in reducing the negative impacts of childhood undernutrition, particularly among those from low socioeconomic backgrounds (Menon et al., 2007). Children under the age of two are more vulnerable to undernutrition and more responsive to nutrition interventions than older children. According to Menon et al., (2007) children who were received the preventive program for the entire period of maximum nutritional vulnerability (from 6-23 months of age) benefited more from the intervention than children who received it for a portion of this time.

To date, only few studies have investigated the effect of MNP among children with normal weight-for-age, length-for-age, and weight-for-length at baseline as preventive strategy (Cardoso et al., 2016; Oliveira et al., 2016). No significant difference in the prevalence of stunting was observed between intervention and control groups in a controlled trial in Brazil (Cardoso et al., 2016), while a significant increase in height-for-age z-scores was observed among Brazilian Amazonian children who were MNP-supplemented daily compared to the control group who received routine paediatric care in health clinis (Oliveira et al., 2016). Thus, the lack of proven benefits of MNP in young children with normal growth, make it difficult to define the best approach in reducing underweight, stunting and wasting.

The potential effect of MNP on protecting children with normal haemoglobin concentration (Hb $\geq$11 g/dL) against anaemia is inconclusive with most previous MNP efficacy trials were aimed at reducing the prevalence of anaemia among anaemic children at baseline (Arcanjo et al., 2019; Barffour et al., 2019; Barth-Jaeggi et al., 2015; Ford et al., 2020; Goyena et al., 2018; Hess et al., 2019; Kejo et al., 2019; Luo et al., 2017; Neufeld et al., 2019; Rahman et al., 2019; Rana and Schellenberg, 2019; Samuel et al., 2018; Somasse et al., 2018). The impact of MNP on children may vary depending on the anaemia status of children at baseline. Pressman et al., (2017) highlighted that host-related factors such as nutritional status could influence the bioavailability of micronutrients. Children with micronutrient deficiencies commonly have affected mucosal integrity, which could affect the capacity of general absorptive, as well as specific mechanisms required for the uptake of various micronutrients (Costa, 2020). Moreover, Blanco-Rojo and Vaquero (2019) reported that iron status of the target population group could influence the efficacy of food fortification in the improvement of micronutrients status.

Although several MNP interventions have been shown to be safe and have no adverse events among the recipients in Laos, Bangladesh, Burkina Faso, Mali, Philippines, Eastern Uganda, Tanzania, Brazil and China (Barffour et al., 2019; Hess et al., 2019; Rana and Schellenberg 2019; Lanou et al., 2019; Mahfuz et al., 2020; Somasse et al., 2018; Goyena et al., 2018; Ford et al., 2020; Kejo et al., 2019; Arcanjo et al., 2018; Luo et al., 2017), the adverse events of MNP remain uncertain as a previous trial among children aged 6-18-months old in Pakistan discovered that MNP significantly increased the diarrhoea prevalence and incidence of bloody diarrhoea (Soofi et al., 2013). Moreover, a systematic review indicated that the most commonly reported side effects were diarrhoea, vomiting, and constipation (de Barros and Cardoso et al., 2016).

MNP with 15 micronutrients has the potential to increase the proportion of children meeting the recommended energy intake, protein requirement, vitamin A and iron intake (Goyena et al., 2018). Even so, the researchers reported that most of children's intakes remained insufficient in energy. The study also showed that the proportion of children who met iron requirement was significantly higher among children who received MNP with 15 micronutrients but lower in meeting protein requirement than those who received MNP with 9 micronutrients (Goyena et al., 2018). The importance of complementary feeding needs to be explained to the caregivers during MNP delivery in order to achieve the impact of MNP on child nutritional status (Siekmans et al., 2017).

Many strategies and initiatives practiced by the government to address the problem of child undernutrition in the country under the Programme for the Rehabilitation of Malnourished Children since 1989 that provides food baskets to the undernourished children from low-income households. Furthermore, Community Feeding Programme is implemented since 2013 specifically to improve the nutritional status of OA children aged 6 months to below 6 years old in rural Perak, Pahang, Kelantan and the Penan Community in Sarawak. In addition to receiving food baskets and health education, undernourished OA children in this program are given complementary food includes milk, cereals, multivitamins with iron and fish oil, and Ready to Use Therapeutic Food (RUTF) by OA volunteers accompanied by their mothers. Even with successful implementation and findings from these programmes, the prevalence of underweight, stunting, wasting and anaemia in the OA children is much higher than the general population. Incorporating MNP as part of the programmes may have contributed in lowering the problems of undernutrition among children from poor households, particularly OA children.

Information on the potential effects of MNP as a preventive strategy of underweight, stunting, wasting and anaemia in children with normal nutritional status at baseline is limited. Thus, this study aimed to address the following questions:

1. Is the use of MNP feasible in OA children in terms of compliance, parental acceptance, child preference and adverse effects in a randomised-controlled trial among OA young children?
2. Is there any difference(s) (before and after MNP intervention) in growth, iron status and dietary intakes within the intervention and control groups?
3. Is there any difference(s) (before and after MNP intervention) in growth, iron status and dietary intakes between the intervention and control groups?

1.3 Research Objectives

Phase 1: Feasibility Study of Micronutrients Powder Supplementation

1.3.1 General Objective

To assess the feasibility of using Micronutrients Powder (MNP) among OA children in a randomised-controlled trial among OA children.

1.3.2 Specific Objective

To determine the feasibility of using MNP in terms of compliance, parental acceptance, child preference and adverse effects among OA children.

Phase 2: Micronutrients Powder Supplementation Trial

1.3.3 General Objective

To determine the effects of MNP on nutritional status (growth, iron status and dietary intakes) of OA young children (6 to 24 months) in Selangor.

1.3.4 Specific Objectives

1) To compare the differences between the intervention and control groups at baseline in:
   i) growth [weight, length, weight-for-age (WAZ), length-for-age (LAZ) and weight-for-length (WLZ)],
   ii) iron status (haemoglobin concentration),
   iii) dietary intakes (energy, nutrients, and food group intakes).

2) To determine the differences (before and after MNP intervention) within the intervention and control groups related to:
   i) growth [weight, length, weight-for-age (WAZ), length-for-age (LAZ) and weight-for-length (WLZ)],
   ii) iron status (haemoglobin concentration),
   iii) dietary intakes (energy, nutrients, and food group intakes).

3) To compare the differences (before and after MNP intervention) between the intervention and control groups related to:

   i) growth [weight, length, weight-for-age (WAZ), length-for-age (LAZ) and weight-for-length (WLZ), prevalence of underweight/ stunting/ wasting],

   ii) iron status (haemoglobin concentration), prevalence of anaemia,

   iii) dietary intakes (energy, nutrients and food group intakes),

1.4 Research Hypotheses

1) There is no significant difference between the intervention and control groups at baseline in:

   i) growth [weight, length, weight-for-age (WAZ), length-for-age (LAZ) and weight-for-length (WLZ)],

   ii) iron status (haemoglobin concentration),

   iii) dietary intakes (energy, nutrients and food group intakes).

2) There are significant differences (before and after MNP intervention) within the intervention and control groups related to:

   i) growth [weight, length, weight-for-age (WAZ), length-for-age (LAZ) and weight-for-length (WLZ)],

   ii) iron status (haemoglobin concentration),

   iii) dietary intakes (energy, nutrients and food group intakes).

3) There are significant differences (before and after MNP intervention) between the intervention and control groups related to:

   i) growth [weight, length, weight-for-age (WAZ), length-for-age (LAZ) and weight-for-length (WLZ), prevalence of underweight/ stunting/ wasting,

   ii) iron status (haemoglobin concentration), prevalence of anaemia,

   iii) dietary intakes (energy, nutrients and food group intakes),

1.5 Research Framework

The research framework for this study is shown in Figure 1.1. Phase 1 of this study was a feasibility study which assessed the compliance, parental acceptance, child preference and adverse effects of MNP among children aged 6 to 36 months old. The findings of this feasibility study provided support for the implementation of a randomised-controlled trial among OA children. The second phase of this study was a MNP supplementation trial conducted over 12 months which determined the effect of MNP as a preventive strategy of undernutrition among OA children aged 6 to 24 months old. The difference in age groups of children involved in Phase 1 and Phase 2 is because Phase 2 was a trial conducted over 12 months that involved OA children aged within 6 to 24 months at baseline and growing up to 18 to 36 months after 12 months of the supplementation. Thus, Phase 1 need to be conducted among children aged 6 to 36 months old as to determine the compliance, parental acceptance, child preference and adverse effects of MNP within the age range before the implementation of Phase 2. In Phase 2, the intervention group was supplemented with three sachets of MNP in powdered form each week for every other day, for a period of 12 months in addition to receiving health and nutrition advices. The control group received health and nutrition advices that were similar to the intervention group. This study reported the differences (before and after intervention) in weight, length, WAZ, LAZ, WLZ and blood haemoglobin as primary outcomes and dietary intakes (energy, nutrients and food group intake) as secondary outcomes within and between the intervention and control groups. Socio-economic and child factors, dietary intakes, vaccination and sanitation were examined as possible covariates in this study.

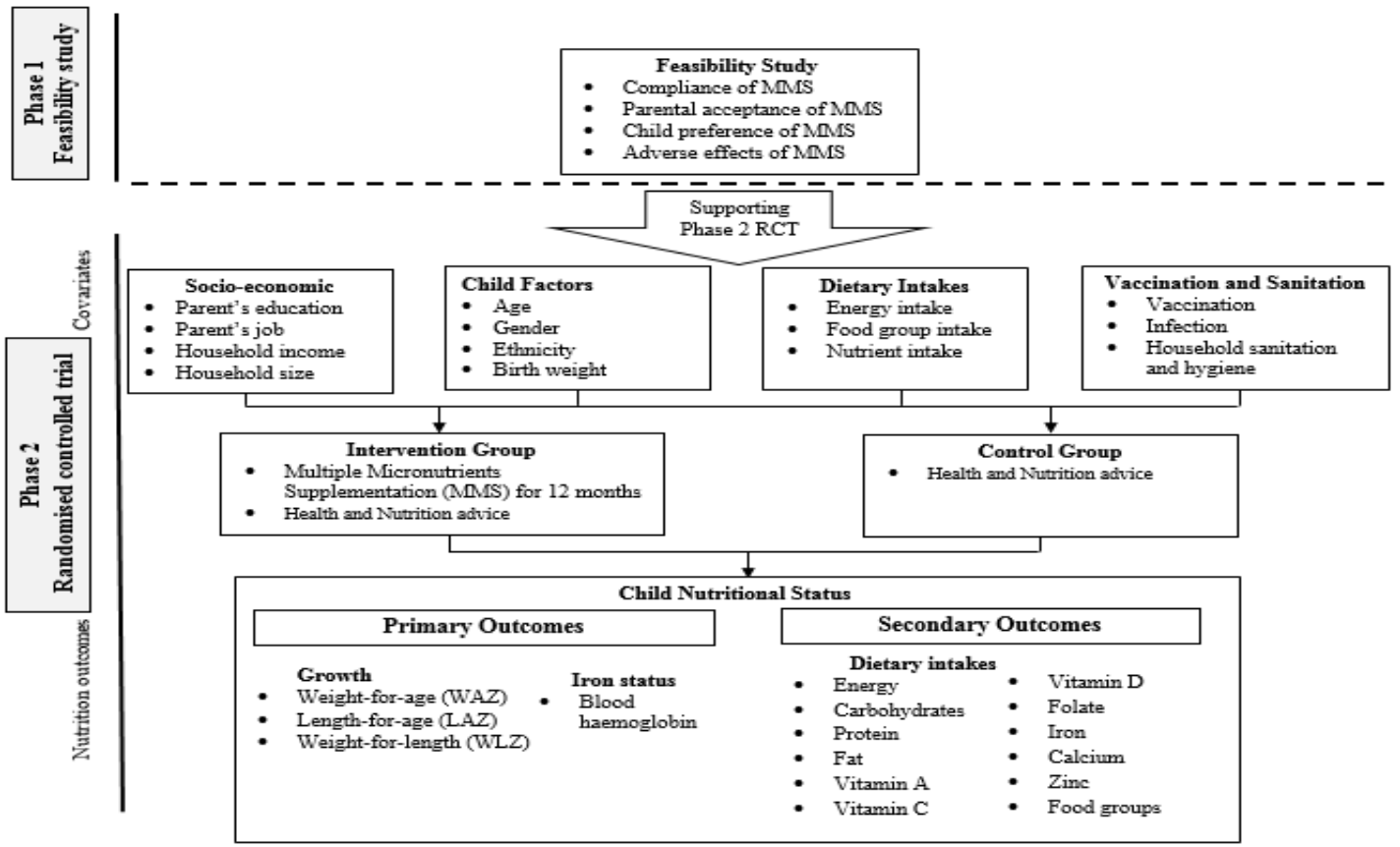

Figure 1.1 : Research framework

1.6 Significance of Study

In Malaysia, studies have shown that the prevalence of undernutrition and anaemia in OA children under five are relatively higher than those observed for the general population, even though many strategies have been implemented. Previous studies have demonstrated the effect of MNP as a recuperative strategy of undernutrition in children. Only a small number of MNP trials, have evaluated the use of MNP as a preventive strategy of undernutrition among children with normal growth. This present study is important as it attempted to find an effective preventive strategy of undernutrition among OA children (who had normal nutritional status at baseline) as they are known to have higher risks of undernutrition.

By determining the effect of MNP on growth indicators, health professionals can address the problem of undernutrition in children with normal growth through developing effective preventive strategies such as MNP program for this vulnerable group. Findings from this study also can be used as a reference for future studies or nutrition interventions in closing the gap of nutrition disparities between children of OA and general population. Moreover, findings of this study would help nutritionist involved in the design, implementation, and scaling-up of national nutrition actions in implementing MNP supplementation as part of a national infant and young child feeding programme, particularly for OA children.

Most previous MNP trials have demonstrated the curative effect of MNP on anaemia status among anaemic children at baseline and found varied effects between trials. Lack of studies on MNP as an approach for anaemia prevention, render it difficult to define the best strategy in protecting OA children against anaemia. This present study aimed to determine the effect of MNP on iron status of OA children with normal blood haemoglobin at baseline. This information is significant to gather a robust evidence on whether MNP has a positive effect in protecting children against anaemia.

Previous MNP trials have shown the impact of MNP supplementation towards improving dietary practices such as minimum dietary diversity, minimum acceptable diet, minimum meal frequency and continued breastfeeding at 2 years of age. However, the effect of MNP in improving child dietary practices in terms of adequacy of energy and nutrients in comparison with the Malaysian Recommended Nutrient Intakes (NCCFN, 2017) and food groups according to the recommended goals in the Malaysian Guidelines for Feeding of Infants and Young Children (MOH, 2008) are still unknown as OA households are widely known to have financial constraints and unique cultural feeding practices. Hence, the findings of this study will fill this information gap on the potential effectiveness of MNP in improving dietary practices of OA young children.

In designing and planning for a randomised controlled trial (RCT), factors such as compliance, parental acceptance, child preference and adverse effects of MNP are important to be assessed in order to investigate areas of uncertainty about MNP trial. A feasibility study plays an important role in modifying the design and conduct of MNP

trial, and consequently increasing the value of the research. Therefore, the feasibility study that was conducted before the MNP trial is important as a reference to other researchers and health professionals when designing a trial or MNP intervention in Malaysia.

1.7 Operational Definition

There are some terms in this study, which need clarification for better understanding of what they mean within the context of the study.

Underweight: Defined as below minus two standard deviations from median weight-for-age of reference population (<-2 SD from median weight-for-age).

Stunting: Defined as below minus two standard deviations from median length- or height-for-age of reference population (<-2 SD from median length- or height-for-age).

Wasting: Defined as below minus two standard deviations from median weight-for-length or -height of reference population (<-2 SD from median weight-for-length or -height).

Anaemia: Defined as below 11.0 g/dL of blood haemoglobin concentration.

Temuan: Defined as a Proto-Malay ethnic group indigenous of Peninsular Malaysia. The Temuans are classified as part of Orang Asli group according to the Malaysian government. They are also one of the largest (only smaller in population in comparison to the Semai people and Jakun people) and the most widespread of the Orang Asli ethnic groups.

Temuan cluster: Defined as having at least 80% of the households in the village are of Temuan ethnicity.

Micronutrients Powder (MNP): It is a mixture of micronutrients in powder form that can be mixed directly into any ready-to-eat semi-solid food. MNP is manufactured by DSM Singapore Industrial Pte. Ltd. Nutritional Products. MNP sachet weighed 1 gram, consisting of ten vitamins (A, C, D, E, B1, B2, B6, B12, folic acid, niacin) and five minerals (iron, zinc, copper, iodine, selenium).

Dietary intake: Daily eating patterns of an individual, including specific foods and calories consumed and relative quantities. Type and portion size of consumed foods and beverages were obtained by asking about the type and amount of consumed food items over the previous day (midnight to midnight) or over the last 24 hours using a method of 24-hour diet recall. The dietary intake includes intakes of energy, protein, carbohydrate, fat, vitamin A, vitamin C, vitamin D, folate, iron, calcium, and zinc.

Food groups: A collection of foods that share similar nutritional properties or biological classifications. Food groups include grains and cereals, meat and poultry, fish, legumes, milk and dairy products, fruits and vegetables.

REFERENCES

Abdullah, S. Z. S., & Saleh, R. M. (2019). Breastfeeding knowledge among indigenous Temiar women: a qualitative study. *Malaysian Journal of Nutrition*, *25*(1), 117-128.

Abedi, P., Abbaspor, Z., Montazeri, S., Vakili, M., & Haghigheizadeh, M. (2013). Food Insecurity Prevalence and its Related Factors in Households in Ahvaz, Iran. *Malaysian Journal of Nutrition*, *19*(3), 363-369.

Aini, U., Al-Mekhlafi, H., Azlin, M., Shaik, A., Sa'Iah, A., Fatmah, M. S., Ismail, M.G., Firdaus, M.S., Aisah, M.Y., Rozlida, A.R & Norhayati, M. (2007). Serum iron status in Orang Asli children living in endemic areas of soil-transmitted helminths. *Asia Pacific Journal of Clinical Nutrition*, *16*(4), 724-730.

Aggett, P. J. (2010). Population reference intakes and micronutrient bioavailability: a European perspective. *The American Journal of Clinical Nutrition*, *91*(5), 1433S-1437S.

Ahluwalia, N. (2020). Nutrition monitoring of children aged birth to 24 mo (B-24): Data collection and findings from the NHANES. *Advances in Nutrition*, *11*(1), 113-127.

Ahmadi, D., Amarnani, E., Sen, A., Ebadi, N., Cortbaoui, P., & Melgar-Quiñonez, H. (2018). Determinants of child anthropometric indicators in Ethiopia. *BMC Public Health*, *18*(1), 1-9.

Ahmed, T., Hossain, M. I., Islam, M., Ahmed, A. S., Afroze, F., & Chisti, M. J. (2020). Protein-energy malnutrition in children. In *Hunter's Tropical Medicine and Emerging Infectious Diseases* (pp. 1034-1041). Elsevier.

Ahmed, A., Al-Mekhlafi, H. M., Al-Adhroey, A. H., Ithoi, I., Abdulsalam, A. M., & Surin, J. (2012). The nutritional impacts of soil-transmitted helminths infections among Orang Asli schoolchildren in rural Malaysia. *Parasites & Vectors*, *5*(1), 1-9.

Ahmed, T., Hossain, M., & Sanin, K. I. (2012). Global burden of maternal and child undernutrition and micronutrient deficiencies. *Annals of Nutrition and Metabolism*, *61*(Suppl. 1), 8-17.

Albelbeisi, A., Shariff, Z. M., Mun, C. Y., Rahman, H. A., & Abed, Y. (2017). Use of micronutrient powder in at-home foods for young children (6-18 months): a feasibility study. *Pakistan Journal of Nutrition*, *16*(5), 372-377.

Alemayehu, F. R., Mariam, R. G., Loha, E., Anato, A., & Desta, D. T. (2020). Maternal Socio Demographic Characteristics are Associated with Child Stunting in Alamura Subcity of Hawassa, Ethiopia. *Public Health Research*, 10(1): 12-20.

Alemu, B., & Gashu, D. (2020). Association of maternal anthropometry, hemoglobin and serum zinc concentration during pregnancy with birth weight. *Early Human Development*, *142*, 104949: 1-7.

Allotey, D., Flax, V. L., Ipadeola, A., Kwasu, S., Bentley, M. E., Worku, B., & Martin, S. L. (2022). Maternal and paternal involvement in complementary feeding in Kaduna State, Nigeria: The continuum of gender roles in urban and rural settings. *Maternal & Child Nutrition*, e13325.

Al-Mekhlafi, M. H., Surin, J., Atiya, A. S., Ariffin, W. A., Mahdy, A. M., & Abdullah, H. C. (2008). Anaemia and iron deficiency anaemia among aboriginal schoolchildren in rural Peninsular Malaysia: an update on a continuing problem. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, *102*(10), 1046-1052.

Al-Mekhlafi, H. M., Azlin, M., Shaik, A., Sa'iah, A., Fatmah, M. S., Ismail, M. G., Ahmad, F., Aisah, M.Y., Rozlida, A.R. & Norhayati, M. (2005). Protein-energy malnutrition and soil-transmitted helminthiases among Orang Asli children in Selangor, Malaysia. *Asia Pacific Journal of Clinical Nutrition*, *14*(2), 188-194.

Anuar, T. S., Salleh, F. M., & Moktar, N. (2014). Soil-transmitted helminth infections and associated risk factors in three Orang Asli tribes in Peninsular Malaysia. *Scientific Reports*, *4*(1), 1-7.

Aquino, D., Leonard, D., Hadgraft, N., & Marley, J. V. (2018). High prevalence of early onset anaemia amongst Aboriginal and Torres Strait Islander infants in remote northern Australia. *Australian Journal of Rural Health*, *26*(4), 245-250.

Arcanjo, F. P. N., da Costa Rocha, T. C., Arcanjo, C. P. C., & Santos, P. R. (2018). Micronutrient fortification at child-care centers reduces anemia in young children. *Journal of Dietary Supplements*, *16*(6), 689-698.

Aryastami, N. K., & Achadi, E. (2019). Can stunting be corrected?: Lessons from Indonesia. *Research Square*, 1-18.

Ashman, A. M., Collins, C. E., Weatherall, L. J., Keogh, L., Brown, L. J., Rollo, M. E., Smith, R. & Rae, K. M. (2016). Dietary intakes and anthropometric measures of Indigenous Australian women and their infants in the Gomeroi gaaynggal cohort. *Journal of Developmental Origins of Health and Disease*, *7*(5), 481-497.

Atkins, L. A., McNaughton, S. A., Spence, A. C., & Szymlek-Gay, E. A. (2020). Adequacy of iron intakes and socio-demographic factors associated with iron intakes of Australian pre-schoolers. *European Journal of Nutrition*, *59*(1), 175-184.

Atkins, L. A., McNaughton, S. A., Campbell, K. J., & Szymlek-Gay, E. A. (2016). Iron intakes of Australian infants and toddlers: findings from the Melbourne infant feeding, activity and nutrition trial (InFANT) program. *British Journal of Nutrition*, *115*(2), 285-293.

Aurino, E. (2017). Do boys eat better than girls in India? Longitudinal evidence on dietary diversity and food consumption disparities among children and adolescents. *Economics & Human Biology*, *25*, 99-111.

Awasthi, S., Reddy, N. U., Mitra, M., Singh, S., Ganguly, S., Jankovic, I., Grathwohl, D., Cercamondi, C.I & Ghosh, A. (2020). Micronutrient-fortified infant cereal improves Hb status and reduces iron-deficiency anaemia in Indian infants: an effectiveness study. *British Journal of Nutrition*, *123*(7), 780-791.

Awuuh, V. A., Appiah, C. A., & Mensah, F. O. (2019). Impact of nutrition education intervention on nutritional status of undernourished children (6-24 months) in East Mamprusi district of Ghana. *Nutrition & Food Science*. *49(2)*, 262-272.

Baker, S., Trabulsi, J., Evans, T., & Smith, E. (2018). Improving nutrition students' knowledge and perceived competence to provide nutrition education to adults with disabilities via experiential learning. *Journal of the Academy of Nutrition and Dietetics*, *118*(1), 23-29.

Barffour, M. A., Hinnouho, G. M., Kounnavong, S., Wessells, K. R., Ratsavong, K., Bounheuang, B., Chanhthavong B., Sitthideth, D., Sengnam, K., Arnold, C.D. and Brown, K.H.,& Hess, S. Y. (2019). Effects of daily zinc, daily multiple micronutrient powder, or therapeutic zinc supplementation for diarrhea prevention on physical growth, anemia, and micronutrient status in rural Laotian children: a randomized controlled trial. *The Journal of Pediatrics*, *207*, 80-89.

Barragán-Ibañez, G., Santoyo-Sánchez, A., & Ramos-Peñafiel, C. O. (2016). Iron deficiency anaemia. *Revista Médica del Hospital General de México*, *79*(2), 88-97.

Barth- Jaeggi, T., Moretti, D., Kvalsvig, J., Holding, P. A., Njenga, J., Mwangi, A., Chhagan, M.K., Lacroix, C.& Zimmermann, M. B. (2015). In- home fortification with 2.5 mg iron as NaFeEDTA does not reduce anaemia but increases weight gain: a randomised controlled trial in K enyan infants. *Maternal & Child Nutrition*, *11*, 151-162.

Batis, C., Denova-Gutiérrez, E., Estrada-Velasco, B. I., & Rivera, J. (2020). Malnutrition prevalence among children and women of reproductive age in Mexico by wealth, education level, urban/rural area and indigenous ethnicity. *Public Health Nutrition*, *23*(S1), s77-s88.

Belachew, A., & Tewabe, T. (2020). Under-five anemia and its associated factors with dietary diversity, food security, stunted, and deworming in Ethiopia: systematic review and meta-analysis. *Systematic Reviews*, *9*(1), 1-9.

Berhane, H. Y., Jirström, M., Abdelmenan, S., Berhane, Y., Alsanius, B., Trenholm, J., & Ekström, E. C. (2020). Social stratification, diet diversity and malnutrition among preschoolers: a survey of Addis Ababa, Ethiopia. *Nutrients*, *12*(3), 712, 1-15.

Bharati, S., Pal, M., Sen, S., & Bharati, P. (2019). Malnutrition and anaemia among adult women in India. *Journal of Biosocial Science*, *51*(5), 658-668.

Bilenko, N., Belmaker, I., Vardi, H., & Fraser, D. (2010). Efficacy of multiple micronutrient supplementations on child health: study design and baseline characteristics. *The Israel Medical Association Journal: IMAJ*, *12*(6), 342-347.

Billingham, S. A., Whitehead, A. L., & Julious, S. A. (2013). An audit of sample sizes for pilot and feasibility trials being undertaken in the United Kingdom registered in the United Kingdom Clinical Research Network database. *BMC Medical Research Methodology*, *13*(1), 1-6.

Binks, M. J., Beissbarth, J., Oguoma, V. M., Pizzutto, S. J., Leach, A. J., Smith-Vaughan, H. C., McHugh, L., Andrews, R.M., Webby, R., Morris, P.S.& Chang, A. B. (2020). Acute lower respiratory infections in Indigenous infants in Australia's Northern Territory across three eras of pneumococcal conjugate vaccine use (2006–15): a population-based cohort study. *The Lancet Child & Adolescent Health*, *4*(6), 425-434.

Black, M. M., Fernandez-Rao, S., Nair, K. M., Balakrishna, N., Tilton, N., Radhakrishna, K. V., Ravinder, P., Harding, K.B., Reinhart, G., Yimgang, D.P. & Hurley, K. M. (2021). A randomized multiple micronutrient powder point-of-use fortification trial implemented in Indian preschools increases expressive language and reduces anemia and iron deficiency. *The Journal of Nutrition*. 151(7), 2029–2042.

Black, M. M. (2020). Nurturing Care Framework and Implementation Science: promoting nutrition, health and development among infants and toddlers globally. *Nutrition Education: Strategies for Improving Nutrition and Healthy Eating in Individuals and Communities*, *92*, 53-63.

Black, R. E., Alderman, H., Bhutta, Z. A., Gillespie, S., Haddad, L., Horton, S., Lartey, A., Mannar, V., Ruel, M., Victora, C.G. & Webb, P. (2013). Maternal and child nutrition: building momentum for impact. *The Lancet*, *382*(9890), 372-375.

Black, R. E., Allen, L. H., Bhutta, Z. A., Caulfield, L. E., De Onis, M., Ezzati, M., Mathers, C., Rivera, J. & Maternal and Child Undernutrition Study Group. (2008). Maternal and child undernutrition: global and regional exposures and health consequences. *The lancet*, *371*(9608), 243-260.

Blanco-Rojo, R., & Vaquero, M. P. (2019). Iron bioavailability from food fortification to precision nutrition. A review. *Innovative Food Science & Emerging Technologies*, *51*, 126-138.

Bommer, C., Mittal, N., & Vollmer, S. (2020). The Impact of Nutritional Interventions on Child Health and Cognitive Development. *Annual Review of Resource Economics*, *12*, 345-366.

Bong, M. W., Karim, N. A., & Noor, I. M. (2018). Nutritional status and complementary feeding among Penan infants and young children in rural Sarawak, Malaysia. *Malaysian Journal of Nutrition*, *24*, 539-550.

Brito, R. S., do Carmo Filho, J. R., Vila, V. D. S. C., & e Souza, A. C. S. (2020). Epidemiological characteristics and strategies for the prevention of diarrheal disease in indigenous children: A scoping review. *Enfermeria Clinica*, *30*(1), 53-62.

Burnette, C. E., Ka'apu, K., Scarnato, J. M., & Liddell, J. (2020). Cardiovascular health among US Indigenous peoples: A holistic and sex-specific systematic review. *Journal of Evidence-Based Social Work*, *17*(1), 24-48.

Cardoso, M. A., Augusto, R. A., Bortolini, G. A., Oliveira, C. S., Tietzman, D. C., Sequeira, L. A., Hadler, M.C.C., Peixoto, M.D.R.G., Muniz, P.T., Vitolo, M.R. and Lira, P.I.& ENFAC Working Group. (2016). Effect of providing multiple micronutrients in powder through primary healthcare on anemia in young Brazilian children: a multicentre pragmatic controlled trial. *PLoS One*, *11*(3), e0151097, 1-13.

Cediel, G., Perez, E., Gaitán, D., Sarmiento, O. L., & Gonzalez, L. (2020). Association of all forms of malnutrition and socioeconomic status, educational level and ethnicity in Colombian children and non-pregnant women. *Public Health Nutrition*, *23*(S1), s51-s58.

Chakona, G. (2020). Social circumstances and cultural beliefs influence maternal nutrition, breastfeeding and child feeding practices in South Africa. *Nutrition Journal*, *19*, 1-15.

Chakrabarti, S., Singh, P., & Bruckner, T. (2020). Association of poor sanitation with growth measurements among children in India. *JAMA Network Open*, *3*(4), e202791-e202791, 1-13.

Che'Muda, C. M., Ismail, T. A. T., Ab Jalil, R. O. H. A. N. A., Hairon, S. M., Sulaiman, Z. A. H. A. R. A. H., & Johar, N. A. Z. I. R. A. H. (2018). Maternal factors associated with the initiation of exclusive breastfeeding among mothers at one week after delivery in two selected hospitals in Kelantan, Malaysia. *Women Birth*, *25*(4), 112, e243-e251.

Chua, E. Y., Zalilah, M. S., Chin, Y. S., & Norhasmah, S. (2012). Dietary diversity is associated with nutritional status of Orang Asli children in Krau Wildlife Reserve, Pahang. *Malaysian Journal of Nutrition*, *18*(1) 1-13.

Cidro, J., Zahayko, L., Lawrence, H. P., Folster, S., McGregor, M., & McKay, K. (2015). Breast feeding practices as cultural interventions for early childhood caries in Cree communities. *BMC Oral Health*, *15*(1), 1-10.

Cohen, J. (1988). *Statistical power analysis for the behavioural sciences* (2nd edn) (Hillsdale, NJ, Lawrence Earlbaum).

Coimbra, C. E., Santos, R. V., Welch, J. R., Cardoso, A. M., de Souza, M. C., Garnelo, L., Rassi, E., Follér, M.L. & Horta, B. L. (2013). The First National Survey of Indigenous People's Health and Nutrition in Brazil: rationale, methodology, and overview of results. *BMC Public Health*, *13*(1), 1-19.

Cordelia TAD, A., Subapriya, S., & Hnin, P. A. (2019). Nutritional status and dietary intake of Semai Indigenous children below five years in Perak, Peninsular Malaysia. *Malaysian Journal of Public Health Medicine*, *19*(1), 84-100.

Costa, P. N., Soares, A. M., Junior, F. S., Ambikapathi, R., McQuade, E. R., Guerrant, R. L., Caulfield, L.E., Lima, A.A.M. & Maciel, B. L. L. (2020). Dietary intake from complementary feeding is associated with intestinal barrier function and environmental enteropathy in Brazilian children from the MAL-ED cohort study. *British Journal of Nutrition*, *123*(9), 1003-1012.

Creed- Kanashiro, H., Bartolini, R., Abad, M., & Arevalo, V. (2016). Promoting multi-micronutrient powders (MNP) in Peru: Acceptance by caregivers and role of health personnel. *Maternal & Child Nutrition*, *12*(1), 152-163.

Davidson, L., Almgren, A., Sandström, B., & Hurrell, R. F. (1995). Zinc absorption in adult humans: the effect of iron fortification. *British Journal of Nutrition*, *74*(3), 417-425.

da Cunha, M. D. S. B., Campos Hankins, N. A., & Arruda, S. F. (2019). Effect of vitamin A supplementation on iron status in humans: A systematic review and meta-analysis. *Critical reviews in Food Science and Nutrition*, *59*(11), 1767-1781.

Dalcastagnê, S. V., Giugliani, E. R. J., Nunes, L. N., Hauser, L., & Giugliani, C. (2018). Practice of exclusive breastfeeding and its associated factors in a suburban area in Angola: a cross-sectional study. *Sao Paulo Medical Journal*, *136*, 533-542.

Das, M. B., & Mehta, S. K. (2012). *Poverty and Social Exclusion in India*. Dalits. World Bank, Washington, DC.

Dattilo, A. M., & Saavedra, J. M. (2020). Nutrition education: application of theory and strategies during the first 1,000 days for healthy growth. In *Nutrition Education: Strategies for Improving Nutrition and Healthy Eating in Individuals and Communities* (Vol. 92, pp. 1-18). Karger Publishers.

Degarege, D., Degarege, A., & Animut, A. (2015). Undernutrition and associated risk factors among school age children in Addis Ababa, Ethiopia. *BMC Public Health*, *15*(1), 1-9.

Department Of Statistics Malaysia (2016) Press Release Report of Household Income and Basic Amenities Survey 2016. Department Of Statistics Malaysia. Putrajaya.

de Barros, S. F., & Cardoso, M. A. (2016). Adherence to and acceptability of home fortification with vitamins and minerals in children aged 6 to 23 months: A systematic review. *BMC Public Health*, *16*(1), 1-11.

de Groot, R., Handa, S., Ragno, L. P., Spadafora, T., & Ghana LEAP1000 Evaluation Team. (2020). Child malnutrition, consumption growth, maternal care and price shocks: new evidence from Northern Ghana. *Development Studies Research*, *7*(1), 18-30.

De Groot, R., Palermo, T., Handa, S., Ragno, L. P., & Peterman, A. (2015). *Cash transfers and child nutrition: what we know and what we need to know*. Innocenti Working Paper No.2015-07, UNICEF Office of Research, Florence.

De Pee, S., Moench-Pfanner, R., Martini, E., Zlotkin, S. H., Darnton-Hill, I., & Bloem, M. W. (2007). Home fortification in emergency response and transition programming: Experiences in Aceh and Nias, Indonesia. *Food and Nutrition Bulletin*, *28*(2), 189-197.

Dewey, K. G. (2009). Formulations for fortified complementary foods and supplements: review of successful products for improving the nutritional status of infants and young children. *Food and Nutrition Bulletin*, *30*(2_suppl2), S239-S255.

Dominguez-Salas, P., Alarcón, P., Häsler, B., Dohoo, I. R., Colverson, K., Kimani-Murage, E. W., Alonso, S., Ferguson, E., Fèvre, E.M., Rushton, J. & Grace, D. (2016). Nutritional characterisation of low-income households of Nairobi: socioeconomic, livestock and gender considerations and predictors of malnutrition from a cross-sectional survey. *BMC Nutrition*, *2*(1), 1-20.

Doocy, S., Busingye, M., Lyles, E., Colantouni, E., Aidam, B., Ebulu, G., & Savage, K. (2020). Cash and voucher assistance and children's nutrition status in Somalia. *Maternal & Child Nutrition*, *16*(3), e12966, 1-11.

Dunn, M. G., Close, R. M., McKee, S. G., Cordero, R., Japa, I. F., & Lowenthal, E. D. (2020). Evaluation of iron intake in preschool children in a setting with high anemia burden. *International Health*. 00: 1–2.

Dutta, M., Bhise, M., Prashad, L., Chaurasia, H., & Debnath, P. (2020). Prevalence and risk factors of anemia among children 6–59 months in India: A multilevel analysis. *Clinical Epidemiology and Global Health*, *8*(3), 868-878.

Dzed, L., Pokhrel, H. P., Mongar, C., & Zangpo, L. (2020). Addressing micronutrient gaps to reduce anaemia in Bhutan's young children: Early experiences in home fortification. *Nutrition Exchange Asia 2*, 11-12.

Elyana, F. N., Al-Mekhlafi, H. M., Ithoi, I., Abdulsalam, A. M., Dawaki, S., Nasr, N. A., Atroosh, W.M., Abd-Basher, M.H., Al-Areeqi, M.A., Sady, H & Surin, J. (2016). A tale of two communities: intestinal polyparasitism among Orang Asli and Malay communities in rural Terengganu, Malaysia. *Parasites & Vectors*, *9*(1), 1-17.

El Hioui, M., Ahami, A. O. T., Aboussaleh, Y., Rusinek, S., Dik, K., Soualem, A., Azzaoui, F.Z., Loutfi, H. & Elqaj, M. (2008). Risk factors of anaemia among rural school children in Kenitra, Morocco. *East African Journal of Public Health* 5(2), 62-66.

El Kishawi, R.R., Soo, K.L., Abed, Y.A. *et al.* (2015) Anaemia among children aged 2–5 years in the Gaza Strip- Palestinian: a cross sectional study. *BMC Public Health* 15, 319, 1-8.

Economic Planning Unit (2019) National poverty rate, incidence of hardcore poverty by ethnic group, strata and state, Malaysia 1995-2019.

Enos Mirembe, M., Arthur, K., Edson, K., & Clement, M. (2020). The Prevalence and Determinants of Stunting among Children 6-59 Months of Age in One of the Sub-Counties in the Rwenzori Sub-Region, Western Uganda. *Open Journal of Nursing*, 2020, 10, 239-251.

Eunice, M. J., Cheah, W. L., & Lee, P. Y. (2014). Factors Influencing Malnutrition among Young Children in a Rural Community of Sarawak. *Malaysian Journal of Nutrition, 20*(2), 145-164.

Fairweather-Tait, S., Lynch, S., Hotz, C., Hurrell, R., Abrahamse, L., Beebe, S., Bering, S., Bukhave, K., Glahn, R., Hambidge, M. and Hunt, J & Trinidad, P. T. (2005). The usefulness of in vitro models to predict the bioavailability of iron and zinc: a consensus statement from the HarvestPlus expert consultation. *International Journal for Vitamin and Nutrition Research*, *75*(6), 371-374.

Fajariyah, R. N., & Hidajah, A. C. (2020). Correlation between immunization status and mother's height, and stunting in children 2–5 years in Indonesia. *Jurnal Berkala Epidemiologi*, *8*(1), 89-96.

Fançony, C., Lavinha, J., Brito, M., & Barros, H. (2020). Anemia in preschool children from Angola: a review of the evidence. *Porto Biomedical Journal*, *5*(1), e60.

Fanzo, J., Hawkes, C., Udomkesmalee, E., Afshin, A., Allemandi, L., Assery, O., Battersby, J., Bhutta, Z., Chen, K & Schofield, D. (2018). 2018 Global Nutrition Report: Shining a light to spur action on nutrition.

Fasoro, A. A., Faeji, C. O., Oni, O. I., & Oluwadare, T. (2016). Assessment of food safety practices in a rural community in Southwest Nigeria. *Food and Public Health*, *6*(3), 1-6.

Fekadu, Y., Mesfin, A., Haile, D., & Stoecker, B. J. (2015). Factors associated with nutritional status of infants and young children in Somali Region, Ethiopia: a cross-sectional study. *BMC Public Health*, *15*(1), 1-9.

Finkelstein, J. L., Kurpad, A. V., Bose, B., Thomas, T., Srinivasan, K., & Duggan, C. (2020). Anaemia and iron deficiency in pregnancy and adverse perinatal outcomes in Southern India. *European Journal of Clinical Nutrition*, *74*(1), 112-125.

Finnie, S., Peréz-Escamilla, R., & Buccini, G. (2020). Determinants of early breastfeeding initiation and exclusive breastfeeding in Colombia. *Public Health Nutrition*, *23*(3), 496-505.

Ford, N. D., Ruth, L. J., Ngalombi, S., Lubowa, A., Halati, S., Ahimbisibwe, M., Baingana, R., Whitehead Jr, R.D., Mapango, C. & Jefferds, M. E. (2020). An integrated infant and young child feeding and micronutrient powder intervention does not affect anemia, iron status, or vitamin A status among children aged 12–23 months in eastern Uganda. *The Journal of Nutrition*, *150*(4), 938-944.

Garcia-Casal, M. N., Pasricha, S. R., Sharma, A. J., & Peña-Rosas, J. P. (2019). Use and interpretation of hemoglobin concentrations for assessing anemia status in individuals and populations: results from a WHO technical meeting. *Annals of the New York Academy of Sciences*, *1450*(1), 5.

García-Casal, M. N., Layrisse, M., Solano, L., Barón, M. A., Arguello, F., Llovera, D., & Tropper, E. (1998). Vitamin A and β-carotene can improve nonheme iron absorption from rice, wheat and corn by humans. *The Journal of Nutrition*, *128*(3), 646-650.

Geik, O. P., & Sidek, R. (2015). Malnutrition and soil-transmitted helminthic infection among Orang Asli pre-school children in Gua Musang, Kelantan, Malaysia. In *AIP Conference Proceedings* (Vol. 1678, No. 1, p. 050045). AIP Publishing LLC.

Gera, T., Shah, D., & Sachdev, H. S. (2019). Zinc supplementation for promoting growth in children under 5 years of age in low-and middle-income countries: a systematic review. *Indian Pediatrics*, *56*(5), 391-406.

Gewa, C. A., & Yandell, N. (2012). Undernutrition among Kenyan children: contribution of child, maternal and household factors. *Public Health Nutrition*, *15*(6), 1029-1038.

Gibson, R. S. (2005). Principles of nutritional assessment. *Oxford University Press*, USA.

Goldberg, G. R., Black, A. E., Jebb, S. A., Cole, T. J., Murgatroyd, P. R., Coward, W. A., & Prentice, A. M. (1991). Critical evaluation of energy intake data using fundamental principles of energy physiology: 1. Derivation of cut-off limits to identify under-recording. *European Journal of Clinical Nutrition*, *45*(12), 569-581.

Goyena, E. A., Barba, C. V., Talavera, M. T. M., Paunlagui, M. M., Rola, A. C., & Tandang, N. A. (2018). Effects of micronutrient powder and complementary food blend on growth and micronutrient status of Filipino rural children: a randomised controlled trial. *Nutritional Status, Dietary Intake and Body Composition*, *24*(4), 475.

Green, L. E., Cliffer, I. R., Suri, D. J., Caiafa, K. R., Rogers, B. L., & Webb, P. J. (2020). Advancing nutrition in the international food assistance agenda: progress and future directions identified at the 2018 Food Assistance for Nutrition Evidence Summit.

Guyatt, H., Muiruri, F., Mburu, P., & Robins, A. (2020). Prevalence and predictors of underweight and stunting among children under 2 years of age in eastern Kenya. *Public Health Nutrition*, *23*(9), 1599-1608.

Haemamalar, K., Zalilah, M. S., & Neng Azhanie, A. (2010). Nutritional status of Orang Asli (Che Wong tribe) adults in Krau Wildlife Reserve, Pahang. *Malaysian Journal of Nutrition*, *16*(1).

Haile, A. & Abebaw M. (2020). Prevalence of undernutrition and associated factors among children aged 6–59 months in Bishoftu Town, Oromia Region, Ethiopia. *Food Proc Nutr Sci*, *1*(1), 8-24.

Halati, S. VH (2013). Home fortification in refugee camps: micronutrient powder supplementation program for Bhutanese refugee children in Jhapa and Morang districts, Nepal. Geneva: The HF-TAG website (http://hftag. gainhealth. org/).

Hamid, S. B. A., & Zaidi, N. M. (2020). Predictors of Prenatal Breastfeeding Self-Efficacy in Malaysian Women: a Cross-Sectional Study. *Jurnal Gizi dan Pangan*, *15*(1), 53-62.

Hamid, S. B. A., Chih, H. J., & Binns, C. (2017). Predictors of Breastfeeding Intention in Malaysia. *Environment-Behaviour Proceedings Journal*, *2*(5), 161-167.

Hanley- Cook, G., Argaw, A., Dahal, P., Chitekwe, S., & Kolsteren, P. (2020). Infant and young child feeding practices and child linear growth in Nepal: Regression–decomposition analysis of national survey data, 1996–2016. *Maternal & Child Nutrition*, e12911.

Hasan, M. M., Uddin, J., Pulok, M. H., Zaman, N., & Hajizadeh, M. (2020). Socioeconomic Inequalities in Child Malnutrition in Bangladesh: Do They Differ by Region?. *International Journal of Environmental Research and Public Health*, *17*(3), 1079.

Hashim, S., Ishak, A., & Muhammad, J. (2020). Unsuccessful Exclusive Breastfeeding and Associated Factors among the Healthcare Providers in East Coast, Malaysia. *Korean Journal of Family Medicine*, *41*(6), 416.

Henry, C. J. K. (2005). Basal metabolic rate studies in humans: measurement and development of new equations. *Public Health Nutrition*, *8*(7a), 1133-1152.

Hertzog, M. A. (2008). Considerations in determining sample size for pilot studies. *Research in Nursing & Health*, *31*(2), 180-191.

Hess, S. Y., Wessells, K. R., Hinnouho, G. M., Barffour, M. A., Sanchaisuriya, K., Arnold, C. D., Brown, K.H., Larson, C.P., Fucharoen, S. & Kounnavong, S. (2019). Iron status and inherited haemoglobin disorders modify the effects of micronutrient powders on linear growth and morbidity among young Lao children in a double-blind randomised trial. *British Journal of Nutrition*, *122*(8), 895-909.

Hirvonen, K., Sohnesen, T. P., & Bundervoet, T. (2020). Impact of Ethiopia's 2015 drought on child undernutrition. *World Development*, *131*, 104964.

Hondru, G., Laillou, A., Wieringa, F. T., Poirot, E., Berger, J., Christensen, D. L., & Roos, N. (2020). Age-appropriate feeding practices in cambodia and the possible influence on the growth of the children: A longitudinal study. *Nutrients*, *12*(1), 12.

Horta, B. L., Santos, R. V., Welch, J. R., Cardoso, A. M., dos Santos, J. V., Assis, A. M. O., Lira, P.C.& Coimbra Jr, C. E. (2013). Nutritional status of indigenous children: findings from the First National Survey of Indigenous People's Health and Nutrition in Brazil. *International Journal for Equity In Health*, *12*(1), 1-13.

Hussein, T. H., Mgongo, M., Uriyo, J. G., Damian, D. J., Stray-Pedersen, B., Msuya, S. E., & Wandel, M. (2019). Exclusive breastfeeding rates and factors associated with exclusive breastfeeding practices in northern Tanzania: measurement using two different methodologies—24 hours recall and recall since birth. *International Journal of Maternal and Child Health and AIDS*, *8*(1), 32.

Huybrechts, I., Lin, Y., De Keyzer, W., Matthys, C., Harvey, L., Meirhaeghe, A., Dallongeville, J., Sarria, B., De Backer, G.& De Henauw, S. (2012). Intake and dietary sources of haem and non-haem iron in Flemish preschoolers. *European Journal of Clinical Nutrition*, *66*(7), 806-812.

Huynh, D. T., Estorninos, E., Capeding, M. R., Oliver, J. S., Low, Y. L., & Rosales, F. J. (2016). Impact of long-term use of oral nutritional supplement on nutritional adequacy, dietary diversity, food intake and growth of Filipino preschool children. *Journal of Nutritional Science*, *5*.

Iannotti, L. L., Chapnick, M., Nicholas, J., Gallegos- Riofrio, C. A., Moreno, P., Douglas, K., Habif, D., Cui, Y., Stewart, C., Lutter, C.K.& Waters, W. F. (2020). Egg intervention effect on linear growth no longer present after two years. *Maternal & Child Nutrition*, *16*(2), e12925.

Ibrahim, A. G., Tijani, M. K., & Nwuba, R. I. (2020). A Cross-Sectional Study of the Prevalence and Risk Factors of Soil Transmitted Helminthes Infection and Stunting Among School-aged Children in Ibadan. *bioRxiv*.

Ibrahim, T., Zemene, E., Asres, Y., Seyoum, D., Tiruneh, A., Gedefaw, L., & Mekonnen, Z. (2018). Epidemiology of soil-transmitted helminths and Schistosoma mansoni: a base-line survey among school children, Ejaji, Ethiopia. *The Journal of Infection in Developing Countries*, *12*(12), 1134-1141.

Ickes, S., Oddo, V., Nduati, R., Denno, D., Sanders, H., Kinyua, J., Iannotti, L., Singha, B., Farquhar, C. & Walson, J. (2020). Lower Prevalence of Exclusive Breastfeeding Among Employed Mothers: Results from a Cross-Sectional Survey in Naivasha, Kenya. *Current Developments in Nutrition*, *4*(Supplement_2), 1010-1010.

Inayati, D. A., Scherbaum, V., Purwestri, R. C., Wirawan, N. N., Suryantan, J., Hartono, S., Bloem, M.A., Pangaribuan, R.V., Biesalski, H.K., Hoffmann, V. & Bellows, A. C. (2012). Combined intensive nutrition education and micronutrient powder supplementation improved nutritional status of mildly wasted children on Nias Island, Indonesia. *Asia Pacific Journal of Clinical Nutrition*, *21*(3), 361-373.

International Labour Office. (2017). The rights of indigenous peoples in Asia: a human rights-based overview of national legal and policy frameworks against the backdrop of country strategies for development and poverty reduction/ Stefania Errico; International Labour Office, Gender, Equality and Diversity Branch. - Geneva: ILO, 2017.

Islam, M. A., Mamun, A. S. M. A., Hossain, M. M., Bharati, P., Saw, A., Lestrel, P. E., & Hossain, M. G. (2019). Prevalence and factors associated with early initiation of breastfeeding among Bangladeshi mothers: a nationwide cross-sectional study. *PloS one*, *14*(4), e0215733.

Islam, M., Bari, F. S., Chayon, S. M., Yesmin, F., Akter, S., & Kashem, S. B. (2020). A cross-sectional study on nutritional status and dietary patterns of children with autism. *Malaysian Journal of Nutrition*, *26*(3).

IWGIA (2018) *The Indigenous World 2018*. International Work Group for Indigenous Affairs. Copenhagen, Denmark.

IWGIA (2016) *The Indigenous World 2016*. International Work Group for Indigenous Affairs. Copenhagen, Denmark.

IWGIA (2010) *The Indigenous World 2010*. International Work Group for Indigenous Affairs. Copenhagen, Denmark.

Jack, S. J., Ou, K., Chea, M., Chhin, L., Devenish, R., Dunbar, M., Eang, C., Hou, K., Ly, S., Khin, M. & Gibson, R. S. (2012). Effect of micronutrient sprinkles on reducing anemia: a cluster-randomized effectiveness trial. *Archives of Pediatrics & Adolescent Medicine*, *166*(9), 842-850.

Jefferds, M. E. D., Ogange, L., Owuor, M., Cruz, K., Person, B., Obure, A., Suchdev, P.S. & Ruth, L. J. (2010). Formative research exploring acceptability, utilization, and promotion in order to develop a micronutrient powder (Sprinkles) intervention among Luo families in western Kenya. *Food and Nutrition Bulletin*, *31*(2_suppl2), S179-S185.

Johar, N., & MCommMed, T. A. T. (2020). Intention and actual exclusive breastfeeding practices among women admitted for elective cesarean delivery in Kelantan, Malaysia: A prospective cohort study. *Medical Journal of Malaysia*, *75*(3), 275.

Kahssay, M., Woldu, E., Gebre, A., & Reddy, S. (2020). Determinants of stunting among children aged 6 to 59 months in pastoral community, Afar region, North East Ethiopia: unmatched case control study. *BMC Nutrition*, *6*(1), 1-8.

Kairiza, T., Kembo, G., Pallegedara, A., & Macheka, L. (2020). The impact of food fortification on stunting in Zimbabwe: does gender of the household head matter?. *Nutrition Journal*, *19*(1), 1-12.

Karlsson, O., Kim, R., Joe, W., & Subramanian, S. V. (2020). The relationship of household assets and amenities with child health outcomes: An exploratory cross-sectional study in India 2015–2016. *SSM-Population Health*, *10*, 100513.

Kassa, T., Meshesha, B., Haji, Y., & Ebrahim, J. (2016). Appropriate complementary feeding practices and associated factors among mothers of children age 6–23 months in Southern Ethiopia, 2015. *BMC Pediatrics*, *16*(1), 1-10.

Kassie, G. W., & Workie, D. L. (2020). Determinants of under-nutrition among children under five years of age in Ethiopia. *BMC Public Health*, *20*(1), 1-11.

Kavosi, E., Rostami, Z. H., Kavosi, Z., Nasihatkon, A., Moghadami, M., & Heidari, M. (2014). Prevalence and determinants of under-nutrition among children under six: a cross-sectional survey in Fars province, Iran. *International Journal of Health Policy And Management*, *3*(2), 71.

Kawo, K. N., Asfaw, Z. G., & Yohannes, N. (2018). Multilevel analysis of determinants of anemia prevalence among children aged 6–59 months in Ethiopia: classical and Bayesian approaches. *Anemia*, *2018*.

Keats, E. C., Neufeld, L. M., Garrett, G. S., Mbuya, M. N., & Bhutta, Z. A. (2019). Improved micronutrient status and health outcomes in low-and middle-income countries following large-scale fortification: evidence from a systematic review and meta-analysis. *The American Journal of Clinical Nutrition*, *109*(6), 1696-1708.

Kejo, D., Petrucka, P., Martin, H., Mosha, T. C., & Kimanya, M. E. (2019). Efficacy of Different Doses of Multiple Micronutrient Powder on Haemoglobin Concentration in Children Aged 6–59 Months in Arusha District. *Scientifica*, *2019*.

Khambalia, A. Z., Lim, S. S., Gill, T., & Bulgiba, A. M. (2012). Prevalence and sociodemographic factors of malnutrition among children in Malaysia. *Food and Nutrition Bulletin*, *33*(1), 31-42.

Khanam, R., Lee, A. S. C., Ram, M., Quaiyum, M. A., Begum, N., Choudhury, A., & Baqui, A. H. (2018). Levels and correlates of nutritional status of women of childbearing age in rural Bangladesh. *Public Health Nutrition*, *21*(16), 3037-3047.

Khor, G. L. (2005). Micronutrient status and intervention programs in Malaysia. *Food and Nutrition Bulletin*, *26*(2_suppl2), S281-S285.

Kirkwood, B. R., & Sterne, J. A. (1988). *Essential medical statistics*. John Wiley & Sons.

Korenromp, E. L., Adeosun, O., Adegoke, F., Akerele, A., Anger, C., Ohajinwa, C., Hotz, C., Umunna, L.& Aminu, F. (2016). Micronutrient powder distribution through maternal, neonatal and child health weeks in Nigeria: Process evaluation of feasibility and use. *Public Health Nutrition*, *19*(10), 1882-1892.

Kucuk, N., Orbak, Z., Karakelloglu, C., & Akcay, F. (2019). The effect of therapy on plasma ghrelin and leptin levels, and appetite in children with iron deficiency anemia. *Journal of Pediatric Endocrinology and Metabolism*, *32*(3), 275-280.

Kumari, A., Choudhary, S. K., & Kumar, S. (2020). study of nutritional and immunization status in children 6 months to 3 years attending immunization clinic, uhtc, igims, Patna. *International Journal of Scientific Research*, *9*(2).

Kusumastuti, A. C., Ardiaria, M., & Hendrianingtyas, M. (2018). Effect of zinc and iron supplementation on appetite, nutritional status and intelligence quotient in young children. *The Indonesian Biomedical Journal*, *10*(2), 133-9.

Laksono, A. D., Wulandari, R. D., Ibad, M., & Kusrini, I. (2021). The effects of mother's education on achieving exclusive breastfeeding in Indonesia. *BMC Public Health*, *21*(1), 1-6.

Lanou, H. B., Osendarp, S. J., Argaw, A., De Polnay, K., Ouédraogo, C., Kouanda, S., & Kolsteren, P. (2019). Micronutrient powder supplements combined with nutrition education marginally improve growth amongst children aged 6–23 months in rural Burkina Faso: A cluster randomized controlled trial. *Maternal & Child Nutrition*, *15*(4), e12820.

Lassi, Z. S., Rind, F., Irfan, O., Hadi, R., Das, J. K., & Bhutta, Z. A. (2020). Impact of infant and young child feeding (IYCF) nutrition interventions on breastfeeding practices, growth and mortality in low-and middle-income countries: systematic review. *Nutrients*, *12*(3), 722.

Leite, M. S., Cardoso, A. M., Coimbra, C. E., Welch, J. R., Gugelmin, S. A., Lira, P. C. I., Horta, B.L., Santos, R.V. & Escobar, A. L. (2013). Prevalence of anemia and associated factors among indigenous children in Brazil: results from the First National Survey of Indigenous People's Health and Nutrition. *Nutrition Journal*, *12*(1), 1-11.

Leonard, D., Buttner, P., Thompson, F., Makrides, M., & McDermott, R. (2019). Anaemia in early childhood among Aboriginal and Torres Strait Islander children of Far North Queensland: a retrospective cohort study. *Australian and New Zealand Journal of Public Health*, *43*(4), 319-327.

Leroy, J. L., Olney, D., & Ruel, M. (2018). Tubaramure, a food-assisted integrated health and nutrition program, reduces child stunting in Burundi: a cluster-randomized controlled intervention trial. *The Journal of Nutrition*, *148*(3), 445-452.

Lestari, E. D., Hasanah, F., & Nugroho, N. A. (2018). Correlation between non-exclusive breastfeeding and low birth weight to stunting in children. *Paediatrica Indonesiana*, *58*(3), 123-7.

Li, S. Q., Guthridge, S., d'Espaignet, E., & Paterson, B. (2007). From infancy to young adulthood: health status in the Northern Territory, 2006.

Li, Z., Kim, R., Vollmer, S., & Subramanian, S. V. (2020). Factors associated with child stunting, wasting, and underweight in 35 low-and middle-income countries. *JAMA Network Open*, *3*(4), e203386-e203386.

Lichtenstein, A. H., Petersen, K., Barger, K., Hansen, K. E., Anderson, C. A., Baer, D. J., & Matthan, N. R. (2021). Perspective: Design and conduct of human nutrition randomized controlled trials. *Advances in Nutrition*, *12*(1), 4-20.

Locks, L. M., Reerink, I., Tucker Brown, A., Gnegne, S., Ramalanjaona, N., Nanama, S., Duggan C.P. & Garg, A. (2017). The impact of integrated infant and young child feeding and micronutrient powder intervention on feeding practices and anemia in children aged 6–23 months in Madagascar. *Nutrients*, *9*(6), 581.

Lönnerdal, B. (2010). Calcium and iron absorption—mechanisms and public health relevance. *International Journal for Vitamin and Nutrition Research*, *80*(4), 293.

Luitel, I., Ban, R. K., & Munikar, S. (2020). Infant and Young Child Feeding Practices Among Chepang Community, Chitwan. *Medical Journal of Shree Birendra Hospital*, *19*(1), 31-38.

Luo, R., Yue, A., Zhou, H., Shi, Y., Zhang, L., Martorell, R., Medina A., Rozelle S. & Sylvia, S. (2017). The effect of a micronutrient powder home fortification program on anemia and cognitive outcomes among young children in rural China: A cluster randomized trial. *BMC Public Health*, *17*(1), 1-16.

Lynch, S. R. (2000). The effect of calcium on iron absorption. *Nutrition research reviews*, *13*(2), 141-158.

Mahfuz, M., Alam, M. A., Das, S., Fahim, S. M., Hossain, M. S., Petri Jr, W. A., Ashorn, P., Ashorn, U & Ahmed, T. (2020). Daily supplementation with egg, cow milk, and multiple micronutrients increases linear growth of young children with short stature. *The Journal of Nutrition*, *150*(2), 394-403.

Mahmud, M. A., Spigt, M., Bezabih, A. M., Dinant, G. J., & Velasco, R. B. (2020). Associations between intestinal parasitic infections, anaemia, and diarrhoea among school aged children, and the impact of hand-washing and nail clipping. *BMC Research Notes*, *13*(1), 1-6.

Malik, N., Nohsheen, F., & Afzal, A. (2020). Determinants of exclusive breastfeeding in Pakistan: an examination of the 2012-2013 Demographic and Health Survey. *Rawal Medical Journal*, *45*(1), 172-175.

Mandal, S., Paul, P., & Chouhan, P. (2019). Impact of maternal education on under-five mortality of children in India: Insights from the National Family Health Survey, 2005–2006 and 2015–2016. *Death studies*, 1-7.

Manyeh, A. K., Amu, A., Akpakli, D. E., Williams, J. E., & Gyapong, M. (2020). Estimating the rate and determinants of exclusive breastfeeding practices among rural mothers in Southern Ghana. *International Breastfeeding Journal*, *15*(1), 1-9.

Manzione, L. C., Kriser, H., Gamboa, E. G., Hanson, C. M., Mulokozi, G., Mwaipape, O., Hoj, T.H., Linehan, M., Torres, S., Hall, P. & Crookston, B. T. (2019). Maternal employment status and minimum meal frequency in children 6-23 months in Tanzania. *International Journal of Environmental Research And Public Health*, *16*(7), 1137.

Marques, R. C., Bernardi, J. V., Dorea, C. C., & Dórea, J. G. (2020). Intestinal parasites, anemia and nutritional status in young children from transitioning western Amazon. *International Journal of Environmental Research And Public Health*, *17*(2), 577.

Marzo, R. R., Ahmad, A., Rou, K. Z., Yin, O. Y., Gill, A. S., Talukder, T., & Win, M. T. (2018). Perception on exclusive breastfeeding among post-natal mothers at primary health centres in Malaysia.

Masroor, N., Ab Rahman, J., Han, T. M., Ali Khan Khattak, M., & Aye, A. (2014). Factors affecting nutritional status of children below 24 months in Pekan district, Pahang, Malaysia. *Malaysian Journal of Nutrition*, *20*(2).

Mas-Harithulfadhli-Agus, A. R., Hamid, N. A., & Rohana, A. J. (2018). Rural child malnutrition and unsuccessful outcome of food basket programme: does ethnicity matter?. *Ethnicity & Health*, *26*(2), 264-279.

Mattiello, V., Schmugge, M., Hengartner, H. (2020) Diagnosis and management of iron deficiency in children with or without anemia: consensus recommendations of the SPOG Pediatric Hematology Working Group. *European Journal of Pediatrics.* 179, 527–545.

McCrory, M. A., Hajduk, C. L., & Roberts, S. B. (2002). Procedures for screening out inaccurate reports of dietary energy intake. *Public Health Nutrition*, *5*(6a), 873-882.

Menon, P., Ruel, M. T., Arimond, M., Habicht, J. P., Hankebo, B., Loechl, C. & Pelto, G. (2007). Prevention is better than cure. *Final Report of The Evaluation: Prevention or Cure*.

Mgongo, M., Chotta, N. A., Hashim, T. H., Uriyo, J. G., Damian, D. J., Stray-Pedersen, B., Msuya, S.E., Wandel, M. & Vangen, S. (2017). Underweight, stunting and wasting among children in Kilimanjaro Region, Tanzania; a population-based cross-sectional study. *International Journal of Environmental Research And Public Health*, *14*(5), 509.

Miller, L. C., Neupane, S., Joshi, N., Lohani, M., Rogers, B. L., Neupane, S., Ghosh, S. & Webb, P. (2020). Multisectoral community development in Nepal has greater effects on child growth and diet than nutrition education alone. *Public Health Nutrition*, *23*(1), 146-161.

Ministry of Health Malaysia (2008) Guidelines for the Feeding of Infants and Young Children. Technical Working Group on Infants and Young Child Feeding, Nutrition Division, Ministry of Health Malaysia.

Mohseni, M., Aryankhesal, A., & Kalantari, N. (2018). Prevalence of malnutrition among Iranâ s under five-year-old children and the related factors: A systematic review and meta-analysis. *Iranian Journal of Pediatrics*, *28*(1).

Monsen, E. R., Hallberg, L., Layrisse, M., Hegsted, D. M., Cook, J. D., Mertz, W., & Finch, C. A. (1978). Estimation of available dietary iron. *The American Journal of Clinical Nutrition*, *31*(1), 134-141.

Monge-Montero, C., van der Merwe, L. F., Papadimitropoulou, K., Agostoni, C., & Vitaglione, P. (2020). Mixed milk feeding: a systematic review and meta-analysis of its prevalence and drivers. *Nutrition Reviews*, *78*(11), 914-927.

Moretti, D. (2017). Plant-Based Diets and Iron Status. In *Vegetarian and Plant-Based Diets in Health and Disease Prevention* (pp. 715-727). Academic Press.

Moshi, F. V., Akyoo, E. E., & Seif, S. A. (2021). Prevalence and Predictor of Exclusive Breastfeeding among Mothers of 0 to 6 months Infants from Pastoralists and Hunters' Community in Tanzania; A Community Based Cross-Sectional Study. *EA Health Research Journal*, *5*(1), 82-90.

Muchie, K. F. (2016). Determinants of severity levels of anemia among children aged 6–59 months in Ethiopia: further analysis of the 2011 Ethiopian demographic and health survey. *BMC Nutrition*, *2*(1), 1-8.

Muenchhoff, M., & Goulder, P. J. (2014). Sex differences in pediatric infectious diseases. *The Journal of Infectious Diseases*, *209*(suppl_3), S120-S126.

Munajat, M. B., Rahim, M. A. F. A., Wahid, W., Rakna, M. I. M. S., Divis, P. C., Chuangchaiya, S. & Idris, Z. M. (2021). Perceptions and prevention practices on malaria among the indigenous Orang Asli community in Kelantan, Peninsular Malaysia. *Malaria Journal*, *20*(1), 1-9.

Murarkar, S., Gothankar, J., Doke, P., Pore, P., Lalwani, S., Dhumale, G., Quraishi, S., Patil, R., Waghachavare, V., Dhobale, R. & Malshe, N. (2020). Prevalence and determinants of undernutrition among under-five children residing in urban slums and rural area, Maharashtra, India: a community-based cross-sectional study. *BMC Public Health*, *20*(1), 1-9.

Murtaza, S. F., Gan, W. Y., Sulaiman, N., Mohd Shariff, Z., & Ismail, S. I. F. (2019). Sociodemographic, nutritional, and environmental factors are associated with cognitive performance among Orang Asli children in Malaysia. *PloS one*, *14*(7), e0219841.

Murtaza, S. F., Gan, W. Y., Sulaiman, N., & Shariff, Z. M. (2018). Factors associated with stunting among Orang Asli preschool children in Negeri Sembilan, Malaysia. *Malaysian Journal of Nutrition*, *24*(2).

Nainggolan, R., Aritonang, E. Y., & Sudaryati, E. (2020). Relationship of Child Individual Factors with Stunting Incidence in Children Aged 24-36 Months at Serdang Bedagai District. *Britain International of Exact Sciences (BIoEx) Journal*, *2*(1), 436-441.

Nair, M., Choudhury, M. K., Choudhury, S. S., Kakoty, S. D., Sarma, U. C., Webster, P., & Knight, M. (2016). Association between maternal anaemia and pregnancy outcomes: a cohort study in Assam, India. *BMJ Global Health*, *1*(1), e000026.

Nandi, A., & Shet, A. (2020). Why vaccines matter: understanding the broader health, economic, and child development benefits of routine vaccination. *Human vaccines & immunotherapeutics*, *16*(8), 1900-1904.

Nasr, N. A., Al-Mekhlafi, H. M., Lim, Y. A., Elyana, F. N., Sady, H., Atroosh, W. M., & Mahmud, R. (2020). A holistic approach is needed to control the perpetual burden of soil-transmitted helminth infections among indigenous schoolchildren in Malaysia. *Pathogens and global health*, *114*(3), 145-159.

National Coordinating Committee on Food and Nutrition, NCCFN (2017) *Recommended nutrient intakes for Malaysia*. A Report of the Technical Working Group on Nutritional Guidelines. National Coordinating Committee on Food and Nutrition, Ministry of Health Malaysia, Putrajaya.

National Health & Morbidity Survey (2016) Maternal and Child Health. Vol I: Methodology and general findings. Institute for Public Health. Ministry of Health Malaysia.

National Health & Morbidity Survey (2015) Non-communicable diseases, risk factors and other health problems. Vol II. Institute for Public Health. Ministry of Health Malaysia.

National Health and Morbidity Survey (2006) *Nutritional status.* Institute for Public Health. Ministry of Health Malaysia.

Nestel, P., & Alnwick, D. (1996). Iron/multi-micronutrient supplements for young children. *Summary and conclusions of a consultation held at UNICEF Copenhagen, Denmark*, 19-20.

Neufeld, L. M., García-Guerra, A., Quezada, A. D., Théodore, F., Bonvecchio Arenas, A., Islas, C. D., Garcia-Feregrino, R., Hernandez, A., Colchero, A & Habicht, J. P. (2019). A fortified food can be replaced by micronutrient supplements for distribution in a Mexican social protection program based on results of a cluster-randomized trial and costing analysis. *The Journal of Nutrition*, *149*(Supplement_1), 2302S-2309S.

Ngui, R., Ishak, S., Chuen, C. S., Mahmud, R., & Lim, Y. A. (2011). Prevalence and risk factors of intestinal parasitism in rural and remote West Malaysia. *PLoS Neglected Tropical Diseases*, *5*(3), e974.

Norimah, A. K., Mohd Nasir, M. T., Hazizi, A. S., Suraya, I., Loh, S., & Nurliyana, A. R. (2014). Association of body weight status and socio-demographic factors with food habits among preschool children in Peninsular Malaysia. *Malaysian Journal of Nutrition*, *20*(3), 303-315.

Norlida, W. W., Zalilah, M. S., Khor, G. L., Ng, W. C., Mirnalini, K., Nawalyah, A. G., & Hejar, A. R. (2007). Breastfeeding Practices and Nutritional Status of Orang Asli Children (Temuan and Mah Meri) in Sepang District and Carey Island, Selangor. *Malaysian Journal of Medicine and Health Sciences*, *3*(2), 1-15.

Nurliyana, A. R., Shariff, Z. M., Taib, M. N. M., Gan, W. Y., & Tan, K. A. (2020). Early growth and home environment are associated with cognitive development in the first year of life of Malaysian infants. *Early Human Development, 140*, 104890.

Ogunlade, A. O., Kruger, H. S., Jerling, J. C., Smuts, C. M., Covic, N., Hanekom, S. M., Mamabolo, R.L. & Kvalsvig, J. (2011). Point-of-use micronutrient fortification: lessons learned in implementing a preschool-based pilot trial in South Africa. *International Journal of Food Sciences And Nutrition*, *62*(1), 1-16.

Ojoniyi, O. O., Odimegwu, C. O., Olamijuwon, E. O., & Akinyemi, J. O. (2019). Does education offset the effect of maternal disadvantage on childhood anaemia in Tanzania? Evidence from a nationally representative cross-sectional study. *BMC Pediatrics*, *19*(1), 1-10.

Olack, B., Burke, H., Cosmas, L., Bamrah, S., Dooling, K., Feikin, D. R., & Breiman, R. F. (2011). Nutritional status of under-five children living in an informal urban settlement in Nairobi, Kenya. *Journal of Health, Population, And Nutrition*, *29*(4), 357.

Oliveira, C. S., Sampaio, P., Muniz, P. T., Cardoso, M. A., & ENFAC Working Group. (2016). Multiple micronutrients in powder delivered through primary health care reduce iron and vitamin A deficiencies in young Amazonian children. *Public Health Nutrition*, *19*(16), 3039-3047.

Osei, A. K., Pandey, P., Spiro, D., Adhikari, D., Haselow, N., De Morais, C., & Davis, D. (2015). Adding multiple micronutrient powders to a homestead food production programme yields marginally significant benefit on anaemia reduction among young children in N epal. *Maternal & Child Nutrition*, *11*, 188-202.

Palacios-Rodríguez, G. O., Mundo-Rosas, V., Parra-Cabrera, S., García-Guerra, A., Galindo-Gómez, C., & Gómez-Humarán, I. M. (2019). Household food insecurity and its association with anaemia in Mexican children: National Health and Nutrition Survey 2012. *International Journal of Public Health*, *64*(8), 1215-1222.

Pangaribuan, R., Erhardt, J. G., Scherbaum, V., & Biesalski, H. K. (2003). Vitamin A capsule distribution to control vitamin A deficiency in Indonesia: effect of supplementation in pre-school children and compliance with the programme. *Public Health Nutrition*, *6*(2), 209-216.

Pereira, I. F. D. S., Andrade, L. D. M. B., Spyrides, M. H. C., & Lyra, C. D. O. (2017). Nutritional status of children under 5 years of age in Brazil: evidence of nutritional epidemiological polarisation. *Ciencia & Saude Coletiva*, *22*, 3341-3352.

Pham, D. T., Hoang, T. N., Ngo, N. T., Nguyen, L. H., Tran, T. Q., Pham, H. M., Huynh, D.T. & Ninh, N. T. (2019). Effect of oral nutritional supplementation on growth in vietnamese children with stunting. *The Open Nutrition Journal*, *13*(1).

Pieters, J., & Rawlings, S. (2020). Parental unemployment and child health in China. *Review of Economics of the Household*, *18*(1), 207-237.

Pilla, L., & Dantas, J. A. (2016). Intra-household nutritional dynamics: A cross-sectional study of Maasai communities in Kenya. *Qualitative Health Research*, *26*(6), 793-806.

Poslusna, K., Ruprich, J., de Vries, J. H., Jakubikova, M., & van't Veer, P. (2009). Misreporting of energy and micronutrient intake estimated by food records and 24 hour recalls, control and adjustment methods in practice. *British Journal of Nutrition*, *101*(S2), S73-S85.

Puri, M., Tathe, G., & Bathe, A. (2020). Assessment of anthropometric measurement of under 5 ages of children in tribal area and its correlation with socio-demographic factors. *Indian Journal of Scientific Research*, *10*(2), 107-114.

Rahman, S., Lee, P., Raqib, R., Roy, A. K., Khan, M. R., & Ahmed, F. (2019). Effect of micronutrient powder (MNP) with a low-dose of iron on hemoglobin and iron biomarkers, and its effect on morbidities in rural Bangladeshi children drinking groundwater with a high-level of iron: a randomized controlled trial. *Nutrients*, *11*(11), 2756.

Rahman, M. A., Halder, H. R., Rahman, M. S., & Parvez, M. (2021). Poverty and childhood malnutrition: Evidence-based on a nationally representative survey of Bangladesh. *Plos one*, *16*(8), e0256235.

Raiten, D. J., & Bremer, A. A. (2020). Exploring the nutritional ecology of stunting: new approaches to an old problem. *Nutrients*, *12*(2), 371.

Rajesh, A., Sreenath, N., Marmavula, S., Krishnamoorthy, C., & Chidambaram, R. (2020). Macro-and Micronutrients in the Development of Food for Babies and Children. *Food Science, Technology and Nutrition for Babies and Children*, 99.

Ramchandran, P., Patel, N., Swaminathan, H., Jadhav, A., Shinde, P., Karnik, P., & Shah, N. G. (2020). Efficacy of micronutrient fortified supplementary foods (ready to cook and ready to eat) and Take-Home Ration (THR) in children with moderate acute malnutrition (mam) using community based approach.

Ramírez-Luzuriaga, M. J., Unar-Munguía, M., Rodríguez-Ramírez, S., Rivera, J. A., & González de Cosío, T. (2016). A food transfer program without a formal education component modifies complementary feeding practices in poor rural Mexican communities. *The Journal of nutrition*, *146*(1), 107-113.

Rana, M. M., & Schellenberg, J. (2019). Effect of Multiple Micronutrient Powder (MNP) and Anthelmintics on morbidity and nutritional status of extremely poor women and children. *World Nutrition, 10*(4), 43-62.

Ray, R. (2020). Mother's autonomy and child anemia: A case study from India. *Children and Youth Services Review, 112*, 104537.

Rehema, M. (2018). Efficacy of Home-Made Foods fortified with micro-nutrient powder in reducing iron deficiency anaemia among children aged 6 - 59 months in Kilosa District, Tanzania. (Unpublished master dissertation). University of Agriculture, Morogoro, Tanzania.

Rivera, J. A., Monterrubio, E. A., González-Cossío, T., García-Feregrino, R., García-Guerra, A., & Sepúlveda-Amor, J. (2003). Nutritional status of indigenous children younger than five years of age in Mexico: results of a national probabilistic survey. *Salud pública de México, 45*, 466-476.

Roberts, S. B., Franceschini, M. A., Silver, R. E., Taylor, S. F., de Sa, A. B., Có, R., Sonco, A., Krauss, A., Taetzsch, A., Webb, P.& Muentener, P. (2020). Effects of food supplementation on cognitive function, cerebral blood flow, and nutritional status in young children at risk of undernutrition: Randomized controlled trial. *British Medical Journal 370*.

Roesler, A., Smithers, L. G., Winichagoon, P., Wangpakapattanawong, P., & Moore, V. (2018). Local perspectives and context in relation to feeding practices of children under 2 years in the mountain villages of northern Thailand. *Public Health Nutrition, 21*(16), 2989-2997.

Rokhayati, R., Salimo, H., & Murti, B. (2019). Contextual Effect of "Posyandu" in the Incidence of Anemia in Children under Five. *Journal of Maternal and Child Health*, *4*(6), 392-402.

Russell, E. A., Daza Atehortua, C., Attia, S. L., Genisca, A. E., Palomino Rodriguez, A., Headrick, A., Solano, L., Camp, E.A., Galvis, A.M., Crouse, H.L. & Thomas, J. A. (2020). Childhood malnutrition within the indigenous Wayuú children of northern Colombia. *Global Public Health, 15*(6), 905-917.

Sah, A. K., Paudel, R., Devkota, M. D., & Sigdel, R. (2020). Prevalence and associated factors of stunting, underweight and wasting among children aged 6-23 months in Dalit and Non-Dalit: A cross sectional comparative study of Dhanusha district, Nepal.

Salam, R. A., MacPhail, C., Das, J. K., & Bhutta, Z. A. (2013). Effectiveness of micronutrient powders (MNP) in women and children. *BMC Public Health, 13*(3), 1-9.

Samadpour, K., Long, K. Z., Hayatbakhsh, R., & Marks, G. C. (2011). Randomised comparison of the effects of Sprinkles and Foodlets with the currently recommended supplement (Drops) on micronutrient status and growth in Iranian children. *European Journal of Clinical Nutrition*, *65*(12), 1287-1294.

Samuel, A., Brouwer, I. D., Feskens, E. J., Adish, A., Kebede, A., De-Regil, L. M., & Osendarp, S. J. (2018). Effectiveness of a program intervention with reduced-iron multiple micronutrient powders on iron status, morbidity and growth in young children in Ethiopia. *Nutrients*, *10*(10), 1508.

SandstroÈm, B. (2001). Micronutrient interactions: effects on absorption and bioavailability. *British Journal of Nutrition*, *85*(S2), S181-S185.

Sandström, B., & Lönnerdal, B. (1989). Promoters and antagonists of zinc absorption. In *Zinc in Human Biology* (pp. 57-78). Springer, London.

Santos, R. V., Borges, G. M., de Campos, M. B., Queiroz, B. L., Coimbra Jr, C. E., & Welch, J. R. (2020). Indigenous children and adolescent mortality inequity in Brazil: What can we learn from the 2010 National Demographic Census?. *SSM-Population Health*, *10*, 100537.

Sarkar, S. (2021). Dearth in access to nutrition across socio-economic strata among rural households in West Bengal, India. *GeoJournal*, *86*(3), 1311-1325.

Saroj, S., Meena, S., & Birua, S. (2019) Utilization of child health care services: a comparative study of Kerala and Haryana. *Our Heritage*. Vol. 67-Issue 8 Dec 2019.

Sarma, H., Uddin, M. F., Harbour, C., & Ahmed, T. (2016). Factors influencing child feeding practices related to home fortification with micronutrient powder among caregivers of under-5 children in Bangladesh. *Food and nutrition Bulletin*, *37*(3), 340-352.

Sazawal, S., Dhingra, P., Dhingra, U., Gupta, S., Iyengar, V., Menon, V. P., Sarkar, A & Black, R. E. (2014). Compliance with home-based fortification strategies for delivery of iron and zinc: its effect on haematological and growth markers among 6-24 months old children in north India. *Journal of Health, Population, And Nutrition*, *32*(2), 217.

Scarpa, G., Berrang-Ford, L., Twesigomwe, S., Kakwangire, P., Galazoula, M., Zavaleta-Cortijo, C., ... & Cade, J. E. (2022). Socio-economic and environmental factors affecting breastfeeding and complementary feeding practices among Batwa and Bakiga communities in south-western Uganda. *PLOS Global Public Health*, *2*(3), e0000144.

Schwab, B. (2020). In the form of bread? A randomized comparison of cash and food transfers in Yemen. *American Journal of Agricultural Economics*, *102*(1), 91-113.

Sebayang, S. K., Dibley, M. J., Astutik, E., Efendi, F., Kelly, P. J., & Li, M. (2020). Determinants of age- appropriate breastfeeding, dietary diversity, and consumption of animal source foods among Indonesian children. *Maternal & Child Nutrition*, *16*(1), e12889.

Shaari, N. D., Shariff, Z. M., Ying, G. W., & Peng, L. S. (2019). A feasibility study of multiple micronutrient supplement for home fortification of foods among Orang Asli children in Negeri Sembilan, Malaysia. *Nutritional Status, Dietary Intake and Body Composition*, *25*(1), 69.

Shafique, S., Sellen, D. W., Lou, W., Jalal, C. S., Jolly, S. P., & Zlotkin, S. H. (2016). Mineral-and vitamin-enhanced micronutrient powder reduces stunting in full-term low-birth-weight infants receiving nutrition, health, and hygiene education: a 2× 2 factorial, cluster-randomized trial in Bangladesh. *The American Journal of Clinical Nutrition*, *103*(5), 1357-1369.

Shariff, Z. M., Lin, K. G., Sariman, S., Lee, H. S., Siew, C. Y., Yusof, B. N. M., ... & Mohamad, M. (2015). The relationship between household income and dietary intakes of 1-10 year old urban Malaysian. *Nutrition Research And Practice*, *9*(3), 278-287.

Sharma, N., Gupta, M., Aggarwal, A. K., & Gorle, M. (2020). Effectiveness of a culturally appropriate nutrition educational intervention delivered through health services to improve growth and complementary feeding of infants: A quasi-experimental study from Chandigarh, India. *PloS one*, *15*(3), e0229755.

Shashikala, S., Kandiah, M., Zalilah, M. S., & Khor, G. L. (2005). Nutritional status of 1-3-year-old children and maternal care behaviours in the Orang Asli of Malaysia. *South African Journal of Clinical Nutrition*, *18*(2), 173-180.

Shenton, L. M., Jones, A. D., & Wilson, M. L. (2020). Factors associated with anemia status among children aged 6–59 months in Ghana, 2003–2014. *Maternal and Child Health Journal*, *24*(4), 483-502.

Shet, A. S., Zwarenstein, M., Rao, A., Jebaraj, P., Arumugam, K., Atkins, S., Mascarenhas, M., Klar, N. & Galanti, M. R. (2019). Effect of a community health worker–delivered parental education and counseling intervention on Anemia cure rates in rural Indian children: a pragmatic cluster randomized clinical trial. *JAMA Pediatrics*, *173*(9), 826-834.

Shrestha, A., Schindler, C., Odermatt, P., Gerold, J., Erismann, S., Sharma, S., Koju, R., Utzinger, J. & Cissé, G. (2020). Nutritional and health status of children 15 months after integrated school garden, nutrition, and water, sanitation and hygiene interventions: a cluster-randomised controlled trial in Nepal. *BMC Public Health*, *20*(1), 1-19.

Shubham, K., Anukiruthika, T., Dutta, S., Kashyap, A. V., Moses, J. A., & Anandharamakrishnan, C. (2020). Iron deficiency anemia: A comprehensive review on iron absorption, bioavailability and emerging food fortification approaches. *Trends in Food Science & Technology*, *99*, 58-75.

Shyam, A. G., Fuller, N. J., & Shah, P. B. (2020). Is child undernutrition associated with antenatal care attendance in Madhya Pradesh, India?. *Journal of Family Medicine and Primary Care*, *9*(3), 1380.

Sidnell, A., Pigat, S., Gibson, S., O'Connor, R., Connolly, A., Sterecka, S., & Stephen, A. M. (2016). Nutrient intakes and iron and vitamin D status differ depending on main milk consumed by UK children aged 12–18 months–secondary analysis from the Diet and Nutrition Survey of Infants and Young Children. *Journal of nutritional science*, *5*.

Siekmans, K., Bégin, F., Situma, R., & Kupka, R. (2017). The potential role of micronutrient powders to improve complementary feeding practices. *Maternal & Child Nutrition*, *13*, e12464.

Simonyan, H., Sargsyan, A., Balalian, A. A., Davtyan, K., & Gupte, H. A. (2020). Short-term nutrition and growth indicators in 6-month-to 6-year-old children are improved following implementation of a multidisciplinary community-based programme in a chronic conflict setting. *Public Health Nutrition*, *23*(1), 134-145.

Singh, S., Srivastava, S., & Upadhyay, A. K. (2019). Socio-economic inequality in malnutrition among children in India: an analysis of 640 districts from National Family Health Survey (2015–16). *International Journal for Equity In Health*, *18*(1), 1-9.

Situmeang, N. S., & Sudaryati, E. (2020). Correlation of Parenting and Nutrient Intake with Stunting in Children 24-59 Months. *Britain International of Exact Sciences (BIoEx) Journal*, *2*(1), 280-285.

Sjöholm, P., Pahkala, K., Davison, B., Juonala, M., & Singh, G. (2020). Socioeconomic status, remoteness and tracking of nutritional status from childhood to adulthood in an Australian Aboriginal Birth Cohort: the ABC study. *BMJ Open*, *10*(1), e033631.

Somassè, Y. E., Dramaix, M., Traoré, B., Ngabonziza, I., Touré, O., Konaté, M., Diallo, M. & Donnen, P. (2018). The WHO recommendation of home fortification of foods with multiple-micronutrient powders in children under 2 years of age and its effectiveness on anaemia and weight: A pragmatic cluster-randomized controlled trial. *Public Health Nutrition*, *21*(7), 1350-1358.

Soofi, S., Cousens, S., Iqbal, S. P., Akhund, T., Khan, J., Ahmed, I., Zaidi, A.K. & Bhutta, Z. A. (2013). Effect of provision of daily zinc and iron with several micronutrients on growth and morbidity among young children in Pakistan: a cluster-randomised trial. *The Lancet*, *382*(9886), 29-40.

Stewart, C. P., Caswell, B., Iannotti, L., Lutter, C., Arnold, C. D., Chipatala, R., & Maleta, K. (2019). The effect of eggs on early child growth in rural Malawi: the Mazira Project randomized controlled trial. *The American Journal of Clinical Nutrition*, *110*(4), 1026-1033.

Stewart, C. P., Dewey, K. G., Lin, A., Pickering, A. J., Byrd, K. A., Jannat, K., Ali, S., Rao, G., Dentz, H.N., Kiprotich, M. & Null, C. (2019). Effects of lipid-based nutrient supplements and infant and young child feeding counseling with or without improved water, sanitation, and hygiene (WASH) on anemia and micronutrient status: results from 2 cluster-randomized trials in Kenya and Bangladesh. *The American Journal of Clinical Nutrition*, *109*(1), 148-164.

Stiller, C. K., Golembiewski, S. K. E., Golembiewski, M., Mondal, S., Biesalski, H. K., & Scherbaum, V. (2020). Prevalence of undernutrition and anemia among santal adivasi children, Birbhum District, West Bengal, India. *International Journal of Environmental Research And Public Health*, *17*(1),

Striessnig, E., & Bora, J. K. (2020). Under-five child growth and nutrition status: spatial clustering of Indian districts. *Spatial Demography*, *8*(1), 63-84.

Sullivan, E. A., Vaughan, G., Li, Z., Peek, M. J., Carapetis, J. R., Walsh, W., Frawley, J., Remond, M.G.W., Remenyi, B., Jackson Pulver, L.& McLintock, C. (2020). The high prevalence and impact of rheumatic heart disease in pregnancy in First Nations populations in a high- income setting: a prospective cohort study. *BJOG: An International Journal of Obstetrics & Gynaecology*, *127*(1), 47-56.

Swanepoel, E., Havemann- Nel, L., Rothman, M., Laubscher, R., Matsungo, T. M., Smuts, C. M., & Faber, M. (2019). Contribution of commercial infant products and fortified staple foods to nutrient intake at ages 6, 12, and 18 months in a cohort of children from a low socio- economic community in S outh A frica. *Maternal & Child Nutrition*, *15*(2), e12674.

Tadesse, F., Alemayehu, Y., Shine, S., Asresahegn, H., & Tadesse, T. (2019). Exclusive breastfeeding and maternal employment among mothers of infants from three to five months old in the Fafan zone, Somali regional state of Ethiopia: a comparative cross-sectional study. *BMC Public Health*, *19*(1), 1-9.

Tahir, E., Ayotte, P., Little, M., Bélanger, R. E., Lucas, M., Mergler, D., Sidi, E.A.L., McHugh, N.G.L. & Lemire, M. (2020). Anemia, iron status, and associated protective and risk factors among children and adolescents aged 3 to 19 years old from four First Nations communities in Quebec. *Canadian Journal of Public Health*, *111*(5), 682-693.

Tam, E., Keats, E. C., Rind, F., Das, J. K., & Bhutta, Z. A. (2020). Micronutrient supplementation and fortification interventions on health and development outcomes among children under-five in low-and middle-income countries: a systematic review and meta-analysis. *Nutrients*, *12*(2), 289.

Teucher, Olivares, & Cori. (2004). Enhancers of iron absorption: ascorbic acid and other organic acids. *International Journal for Vitamin And Nutrition Research*, *74*(6), 403-419.

Tohouenou, M. M., Egbi, G., Ohemeng, A., & Steiner-Asiedu, M. (2019). Anaemia, vitamin-A deficiency, anthropometric nutritional status and associated factors among young school children in Kodzobi, Ghana, a peri-urban community. *African Journal of Food, Agriculture, Nutrition and Development*, *19*(2), 14483-14499.

Tonkin, E., Kennedy, D., Hanieh, S., Biggs, B. A., Kearns, T., Gondarra, V., Dhurrkay, R. & Brimblecombe, J. (2020). Dietary intake of Aboriginal Australian children aged 6–36 months in a remote community: a cross-sectional study. *Nutrition Journal*, *19*(1), 1-12.

Torun, B., Davies, P. W., Livingstone, M. E., Paolisso, M., & Sackett, R. (1996). Energy requirements and dietary energy recommendations for children and adolescents 1 to 18 years old. Discussion. *European Journal of Clinical Nutrition*, *50*, S37-S81.

Tumilowicz, A., Habicht, J. P., Pelto, G., & Pelletier, D. L. (2015). Gender perceptions predict sex differences in growth patterns of indigenous Guatemalan infants and young children. *The American Journal of Clinical Nutrition*, *102*(5), 1249-1258.

Tunbosun, O. E., Rampal, L., Rahman, H. A., & Majid, R. A. (2017). Prevalence and predictors of intestinal worm infections among Semai Aboriginal tribe school children in Tapah, Malaysia. *Malaysian Journal of Medicine and Health Sciences*, *13*(1), 27-34.

Tusting, L. S., Gething, P. W., Gibson, H. S., Greenwood, B., Knudsen, J., Lindsay, S. W., & Bhatt, S. (2020). Housing and child health in sub-Saharan Africa: A cross-sectional analysis. *PLoS medicine*, *17*(3), e1003055.

Udovicich, C., Perera, K., & Leahy, C. (2017). Anaemia in school- aged children in an Australian Indigenous community. *Australian Journal of Rural Health*, *25*(5), 285-289.

Ukegbu, P. O., Uwaegbute, A. C., Ijeh, I. I., & Ukegbu, A. U. (2013). Bacterial load in expressed and stored breast milk of lactating mothers in Abia state, Nigeria. *African Journal of Food, Agriculture, Nutrition and Development*, *13*(4), 8139-8154.

Unar- Munguía, M., Lozada- Tequeanes, A. L., González- Castell, D., Cervantes- Armenta, M. A., & Bonvecchio, A. (2021). Breastfeeding practices in Mexico: Results from the National Demographic Dynamic Survey 2006–2018. *Maternal & Child Nutrition*, *17*(2), e13119.

UNICEF, W. (2019). Levels and trends in child malnutrition: key findings of the 2019 edition of the Joint Child Malnutrition Estimates. *World Health Organization: Geneva, Switzerland*.

UNICEF (2013) Home Fortification Technical Advisory Group: Manual on micronutrient powder (MNP) composition: Guidelines and specifications for defining the micronutrient composition of single serve sachets for specified target populations in low- and middle-income countries with high prevalence of anaemia and micronutrient deficiencies. UNICEF/ World Food Programme.

United Nations Inter-Agency Support Group (2014) *The health of indigenous issues.* Inter-Agency Support Group on Indigenous Peoples' Issues. Thematic paper towards the preparation of the 2014 World Conference on Indigenous Peoples.

UNICEF (United Nations Children's Fund). (2013). Improving Child Nutrition: The Achievable Imperative for Global Progress. New York: UNICEF.

UNICEF (2009). *Tracking progress on child and maternal nutrition: a survival and development priority*. Division of Communication Unicef.

UNICEF. (2006). Preventing And Controlling Micronutrient Deficiencies in Populations Affected By An Emergency Multiple Vitamin And Mineral Supplements For Pregnant And Lactating Women, And For Children Aged 6 To 59 Months.

VanVoorhis, C. W., & Morgan, B. L. (2007). Understanding power and rules of thumb for determining sample sizes. *Tutorials in Quantitative Methods for Psychology*, *3*(2), 43-50.

Vázquez, I. L., Valera, E., Villalobos, M., Tous, M., & Arija, V. (2019). Prevalence of anaemia in children from Latin America and the Caribbean and effectiveness of nutritional interventions: systematic review and meta–analysis. *Nutrients*, *11*(1), 183.

Victora, C. G., Christian, P., Vidaletti, L. P., Gatica-Domínguez, G., Menon, P., & Black, R. E. (2021). Revisiting maternal and child undernutrition in low-income and middle-income countries: variable progress towards an unfinished agenda. *The Lancet* (397), 1388–1399.

Victora, C. G., Adair, L., Fall, C., Hallal, P. C., Martorell, R., Richter, L., Sachdev, H.S. & Maternal and Child Undernutrition Study Group. (2008). Maternal and child undernutrition: consequences for adult health and human capital. *The Lancet*, *371*(9609), 340-357.

Vikram, K., & Vanneman, R. (2020). Maternal education and the multidimensionality of child health outcomes in India. *Journal of Biosocial Science*, *52* (1), 57-77.

Villalpando, S., Shamah-Levy, T., Ramírez-Silva, C. I., Mejía-Rodríguez, F., & Rivera, J. A. (2003). Prevalence of anemia in children 1 to 12 years of age: results from a nationwide probabilistic survey in Mexico. *Salud pública de México*, *45*, 490-498.

Vist, G. E., Suchdev, P. S., De- Regil, L. M., Walleser, S., & Peña- Rosas, J. P. (2011). Home fortification of foods with multiple micronutrient powders for health and nutrition in children under 2 years of age. *Cochrane Database of Systematic Reviews*, (1).

Voice (2021) The vicious cycle of undernutrition and infectious disease: How does it work and what role do vaccines play? The Value of Immunization Compendium of Evidence, Voice. Retrieved from https://immunizationevidence.org/about/.

Vollmer, R. L., & Baietto, J. (2017). Practices and preferences: Exploring the relationships between food-related parenting practices and child food preferences for high fat and/or sugar foods, fruits, and vegetables. *Appetite*, *113*, 134-140.

Walczyk, T., Muthayya, S., Wegmüller, R., Thankachan, P., Sierksma, A., Frenken, L. G., Thomas, T., Kurpad, A & Hurrell, R. F. (2014). Inhibition of iron absorption by calcium is modest in an iron-fortified, casein-and whey-based drink in Indian children and is easily compensated for by addition of ascorbic acid. *The Journal of nutrition*, *144*(11), 1703-1709.

Walczyk, T., Davidsson, L., Rossander-Hulthen, L., Hallberg, L., & Hurrell, R. F. (2003). No enhancing effect of vitamin A on iron absorption in humans. *The American Journal of Clinical Nutrition*, *77*(1), 144-149.

Wang, J., Wang, H., Chang, S., Zhao, L., Fu, P., Yu, W., Man, Q., Scherpbier, R., Pan, L., Duan, Y. & Yin, S. A. (2015). The influence of malnutrition and micronutrient status on anemic risk in children under 3 years old in poor areas in China. *PloS one*, *10*(10), e0140840.

Warren, A. M., Frongillo, E. A., Nguyen, P. H., & Menon, P. (2020). Nutrition intervention using behavioral change communication without additional material inputs increased expenditures on key food groups in Bangladesh. *The Journal of Nutrition*, *150*(5), 1284-1290.

Webb, K., Rutishauser, I., & Knezevic, N. (2008). Foods, nutrients and portions consumed by a sample of Australian children aged 16–24 months. *Nutrition & Dietetics*, *65*(1), 56-65.

Wehr, H., Chary, A., Webb, M. F., & Rohloff, P. (2014). Implications of gender and household roles in Indigenous Maya communities in Guatemala for child nutrition interventions. *International Journal of Indigenous Health*, *10*(1), 100-113.

Wicaksono, F., & Harsanti, T. (2020). Determinants of stunted children in Indonesia: A multilevel analysis at the individual, household, and community levels. *Kesmas: Jurnal Kesehatan Masyarakat Nasional (National Public Health Journal)*, *15*(1), 48-53.

Woldeamanuel, B. T. (2020). Trends and factors associated to early initiation of breastfeeding, exclusive breastfeeding and duration of breastfeeding in Ethiopia: evidence from the Ethiopia demographic and health survey 2016. *International Breastfeeding Journal*, *15*(1), 1-13.

Wong, Y. S., Allotey, P., & Reidpath, D. D. (2018). Why we run when the doctor comes: Orang Asli responses to health systems in transition in Malaysia. *Critical Public Health*, *29*(2), 192-204.

Wong, C. Y., Zalilah, M. S., Chua, E. Y., Norhasmah, S., Chin, Y. S., & Nur'Asyura, A. S. (2015). Double-burden of malnutrition among the indigenous peoples (Orang Asli) of Peninsular Malaysia. *BMC Public Health*, *15*(1), 1-9.

World Health Organization. (2021). Prevalence of anaemia in children aged 6-59 months. Retrieved from https://www.who.int/data/gho/data/indicators/ indicator- details/ GHO/prevalence-of-anaemia-in-children-under-5-years.

World Health Organization. (2021). Malnutrition prevalence among children under 5 years. Retrieved from https://www.who.int/data/gho/data/themes/topics/ indicator-groups/indicator-group-details/GHO/prevalence-of-malnutrition-in-children

World Health Organization. (2020). UNICEF/WHO/The World Bank Group Joint Child Malnutrition Estimates: levels and trends in child malnutrition: key findings of the 2020 edition.

World Health Organization. (2020). WHO/UNICEF Estimates of National Immunization Coverage: Progress and Challenges with Achieving Universal Immunization Coverage. World Health Organization.

World Health Organization. (2020). Soil-transmitted helminth infections. Retrieved from https://www.who.int/news-room/fact-sheets/detail/soil-transmitted-helminth-infections,

World Health Organization. (2016). WHO guideline: use of multiple micronutrient powders for point-of-use fortification of foods consumed by infants and young children aged 6–23 months and children aged 2–12 years. World Health Organization.

World Health Organization (2013) Global Vaccine Action Plan 2011–2020. Geneva: World Health Organization.

World Health Organization. (2011). Guideline: use of multiple micronutrient powders for home fortification of foods consumed by pregnant women. World Health Organization.

World Health Organization. (2011) Haemoglobin concentrations for the diagnosis of anaemia and assessment of severity. Vitamin and Mineral Nutrition Information System. Geneva, World Health Organization, 2011 (WHO/NMH/NHD/MNM/11.1)

World Health Organization (2010) *Country profile indicators: Interpretation guide*. Nutrition Landscape Information System (NLIS). Geneva

WHO (2010) Indicators for Assessing Infant and Young Child Feeding Practices. Part II: Measurement. World Health Organization: Geneva.

World Health Organization, & Centers for Disease Control and Prevention. (2007). Assessing the iron status of populations. *Geneva: World Health Organization*.

World Health Organization and Food and Agricultural Organization of the United Nations (2006) *Guidelines of food fortification with micronutrients*. Geneva: World Health Organization.

World Health Organization (2006) Multicentre Growth Reference Study Group: WHO Child Growth Standards: Length/ height-for-age, weight-for-age, weight-for-length, weight-for-height and body mass index-for-age: Methods and Development. Geneva: World Health Organization.

World Health Organization (2002) The optimal duration of exclusive breastfeeding: a systematic review. Geneva: World Health Organization.

World Health Organization (2001) *Iron Deficiency Anaemia: Assessment, Prevention and Control: a guide for programme managers*. Geneva: World Health Organization.

World Health Organization (1997) WHO Global database on child growth and malnutrition. Geneva: World Health Organization.

Yeasmin, S., & Islam, K. (2016). Prevalence and determinants of undernutrition among school age slum children in Dhaka City. *Bangladesh. Journal of Nutrition Health Sciences*, *3*(2), 201.

Yen, W. C., Shariff, Z. M., Adznam, S. N. A., Sulaiman, N., & Chin, Y. S. (2018). Weight and height faltering in the indigenous children (Orang Asli) of Peninsular Malaysia during the first 2 years of life. *Asia Pacific Journal of Clinical Nutrition*.

Young, M. F., Mehta, R. V., Gosdin, L., Kekre, P., Verma, P., Larson, L. M., & Martorell, R. (2021). Home Fortification of Complementary Foods Reduces Anemia and Diarrhea among Children Aged 6–18 Months in Bihar, India: A Large-Scale Effectiveness Trial. *The Journal of Nutrition.*

Zakaria, L. N., & Minhat, H. S. (2020). Sociodemographic Determinants of Good Hygience Practices Among the Indigenous Primary Caregivers of Under Three Children in Malaysia. *children*, *9*, 20-22.

Zakaria, L. N., Minhat, H. S., Zulkefli, N. A. M., Baharom, A., & Ahmad, N. (2019). Factors contributing towards malnutrition among under five indigenous children: A systematic review. *Indian Journal of Science and Technology*, *12*, 7.

Zalilah, M. S., & Tham, B. L. (2002). Food security and child nutritional status among Orang Asli (Temuan) households in Hulu Langat, Selangor. *The Medical Journal of Malaysia*, *57*(1), 36-50.

Zapata, M. E., Soruco, A. I., & Carmuega, E. (2020). Malnutrition in all its forms and socio-economic indicators in Argentina. *Public Health Nutrition*, *23*(S1), s13-s20.

Zhao, Q., & Yu, X. (2020). Parental nutrition knowledge, iron deficiency, and child anaemia in rural China. *The Journal of Development Studies*, *56*(3), 578-595.

Zhen, F. G., Asma'Ali, H. M. Y., Kamarudin, K. S., Zakaria, N. S., & Zainuddin, A. A. (2021). DIET QUALITY AND NUTRITIONAL STATUS OF ORANG ASLI (ABORIGINAL) CHILDREN OF CAMERON HIGHLANDS'RESETTLEMENT VILLAGES, MALAYSIA. *Prof Khor Geok Lin, PhD and Helda Khusun, PhD*, *52*, 32.

Zlotkin, S. H., Schauer, C., Christofides, A., Sharieff, W., Tondeur, M. C., & Hyder, S. Z. (2005). Micronutrient sprinkles to control childhood anaemia. *PLoS Medicine*, *2*(1), e1.

Zlotkin, S. H., Christofides, A. L., Hyder, S. M., Schauer, C. S., Tondeur, M. C., & Sharieff, W. (2004). Controlling iron deficiency anemia through the use of home-fortified complementary foods. *The Indian Journal of Pediatrics*, *71*(11), 1015-1019.