RESEARCH COMMUNICATION

# Effect of dietary supplementation program on anthropometric status of preschoolers in Taguig City: Research notes

**Ma. Socorro Ignacio[1]*, Arlene C. Castro[2]**

*Corresponding author's email address: meignacio1@up.edu.ph

[1]*Department of Nutrition, College of Public Health, University of the Philippines Manila, Manila, Philippines*
[2]*Rise Against Hunger Philippines, Pasig City, Philippines*

**ABSTRACT**

**Background:** Access to nutritious food among the nutritionally at risk preschool children remains a challenge even in urban households in the Philippines.

**Objectives:** This study determined if the daily consumption of rice-soy meals for 120 days improved the anthropometric status of preschool children enrolled in selected child development centers in low-income barangay in Taguig City. Specifically, it determined if the proportion of underweight preschool children decreased at endline and if there was an increase in the weight of preschool children at endline.

**Methodology:** The study used the before and after study design. The Dietary Supplementation Program was implemented by the LGU's day care teachers. An NGO supplied the rice-soy meal packs. The children were fed with different variants of rice-soy meal pack containing 23 essential micronutrients. Anthropometric measurements were taken before and after 120 days. Data were subjected to Mc Nemar's test to determine changes in the children's nutritional status.

**Results:** A total of 538 children were enrolled in the DSP. Results of Mc Nemar's test showed that there was a significant improvement in the nutritional status (weight-for-age) of underweight preschool children ($p=0.0000001$) while the paired t-test showed that the increase in the weight of preschool children after the 120 day-dietary supplementation program was extremely statistically significant ($p<0.001$).

**Conclusion:** The daily feeding improved the weight of the undernourished children but overweight children maintained their overweight status at endline. The DSP Guidelines should include feeding mechanism for overweight children. The DSP complementary components should also be assessed in improving household food security.

**Keywords:** *dietary supplementation, anthropometry, early childhood development*

## Introduction

Malnutrition remains to be a worldwide nutritional problem. Around 41 million children below five years old are classified as overweight or obese, 159 million are identified as stunted, and 50 million are underweight for their height or wasted. More than one-third of all child deaths in the world are caused by malnutrition-related problems [1].

The problem of undernutrition has been persistent and nagging in the country. Around three in every 10 Filipino children aged 0-60 months are stunted while around two in every 10 are considered underweight. Moreover, the prevalence of overweight children increases as they get older [2]. The increase in the double burden of malnutrition results in a delay in the country's potential for social and economic development [3].

To address this, the Philippine Plan of Action for Nutrition (PPAN 2017-2022) was developed and one of the nutrition-specific interventions recommended to address hunger and food insecurity was the Dietary Supplementation Program (DSP) [4]. The DSP is intended to cater primarily to nutritionally at-risk young children aged six to 59 months [5].

Studies have shown that the DSP has a potential to improve the nutrition situation among the vulnerable populations [6-8]. Despite numerous and multisectoral efforts to address problems in hunger, there are still more than 820 million people

in the world who experience hunger [9]. Access to nutritious food is still a challenge in the National Capital Region (NCR) of the Philippines where more households with preschool children are unable to afford nutritious food [10]. A school-based feeding program is one approach that can address the problem of hunger, increase school attendance, and improve learning outcomes among school children. [10,11].

Supplementary feeding is defined as the provision of extra food to children in addition to their normal diets at home. The program is designed to increase the amount of energy and major nutrients that children consume to enable them to meet a third of their daily requirement for macronutrients such as carbohydrates, proteins, and fats [12].

It was discussed in a systematic review on supplementary feeding that food supplementation among impoverished young children in low-and middle-income countries had resulted in minimal but statistically significant improvement in their weight and height measurements. According to this review, supplementary feeding is more effective when it is supervised in a daycare center because children are able to consume more food and increase their total energy intake as compared to when the food ration is taken home [7]. In some countries, for supplementary feeding programs to be acceptable, implementers usually use cereal and legume mixtures that look like an indigenous staple and are easy to prepare just like a porridge [13].

A set of standard procedures in conducting DSP in the Philippines was developed by NNC in 2011. It aims to (1) improve the nutritional status of targeted undernourished individuals by providing one-third of the recommended energy and nutrient intakes and (2) improve the knowledge, attitudes, and practices of mothers and other household members on basic nutritional practices and monitoring of growth. The implementation of DSP usually takes 90-120 days of feeding the beneficiaries, either at a central location or through home distribution of food ration. After this period, the beneficiaries' state of nutrition is evaluated through anthropometric measurements using weight-for-age (WFA). The guidelines also recommend that simultaneous with the feeding activities, there should be complementary activities which include nutrition education classes for mothers and caregivers on basic nutrition, preparation of nutritious and low-cost meals, as well as child care and livelihood activities to ensure the households' overall food security [5]. Both the government and private institutions that embark on DSP for different types of beneficiaries are encouraged to use the NNC-issued DSP Guidelines.

Several organizations such as national government agencies (NGAs), non-government organizations (NGOs), and even local government units (LGUs) have been engaged in varied nutrition interventions particularly on DSP as far back as the 1980s using a variety of approaches. Rise Against Hunger Philippines (RAHP) is one such local NGO that supports the global vision of ending hunger by 2030. Propelled by this vision, the RAHP makes available micronutrient-filled rice-soy meal packs for distribution to nutritionally at-risk individuals in selected areas in the Philippines. It has an existing partnership with the barangay council in Taguig City since 2017 by providing support in the implementation of nutrition improvement and food security intervention programs in selected daycare centers situated in low-income barangays.

The RAHP-sponsored DSP strictly follows the National DSP Guidelines issued by the NNC. The RAHP's feeding program is meant to fill in the gaps in the government's program such as extending feeding beyond the standard duration of 90 days. Because RAHP supports blanket feeding, all children enrolled in the CDC, even those who have normal weight and are overweight, are fed with RAHP-fortified rice-soy meal packs.

DSPs have been in place for decades but researchers to date have not embarked on evaluating the different modes of DSP. The RAHP has been working with several LGUs in NCR in implementing school-based supplementary feeding programs since 2016. These commissioned works intend to assess the effectiveness of RAHP-sponsored DSP in one of the low-income barangays in Taguig City.

The main objective of this study was to determine if consumption of RAHP rice-soy meals improved the anthropometric status of preschool children enrolled in selected child development centers of a low-income barangay in Taguig City, National Capital Region, Philippines. The specific objectives were the following: (1) to determine if the proportion of underweight preschool children decreased after the 120-day dietary supplementation and (2) to determine if there is an increase in the weight of preschool children after the 120-day dietary supplementation program.

## Methodology

A Before and After Study Design [14] was used to measure the effect of dietary supplementation on the anthropometric status of preschool beneficiaries at the start of the feeding program and 120 days after. Five (5) child development centers in Taguig City were recommended by the LGU to be included in

the study. A total of 538 preschool children enrolled for the School Year 2018-2019 were included in the 120 day-feeding program. They were fed with different variants of the RAHP meal packs. The RAHP fortified rice-soy meal pack is made up of rice, dried soy, dehydrated fruits and vegetables (supplied by local farmers), micronutrient sachet (23 micronutrients), and flavoring sachet (i.e. beef congee, chicken arroz caldo, champorado, and guinataan). The meal pack can be served as rice which can yield six servings or congee style that with 12 cups of water, can serve 12 to 15 children (see Figure 1). Mothers of children after undergoing orientation on basic food safety protocol and how to add different ingredients to the meal packs took turns in preparing the rice meal every day. Before commencing the feeding program, anthropometric measurements (height and weight) were taken from all the students using a calibrated Detecto Platform Scale with height rod. CDC teacher-feeding coordinators spearheaded the collection of anthropometric data with assistance from the barangay nutrition scholar. The feeding coordinators were trained by the staff from Taguig City's Office of Social Welfare and Development in collecting and recording anthropometric measurements of preschool children. Three anthropometric measurements were obtained at Day 0, Day 60, and Day 120 (Table 1). To assess the effect of the DSP on the anthropometric status of children, the weight-for-age (WFA) was used as an index of nutritional assessment and this is consistent with the national DSP Guidelines. Using the Z Score of the Child Growth Standards [15], the WFA of the children was used to classify them under the normal, severely underweight, underweight, and overweight categories. Data gathered were filed, encoded, and validated by RAHP staff through MS Excel. Height measurements were taken but because of missing data at the

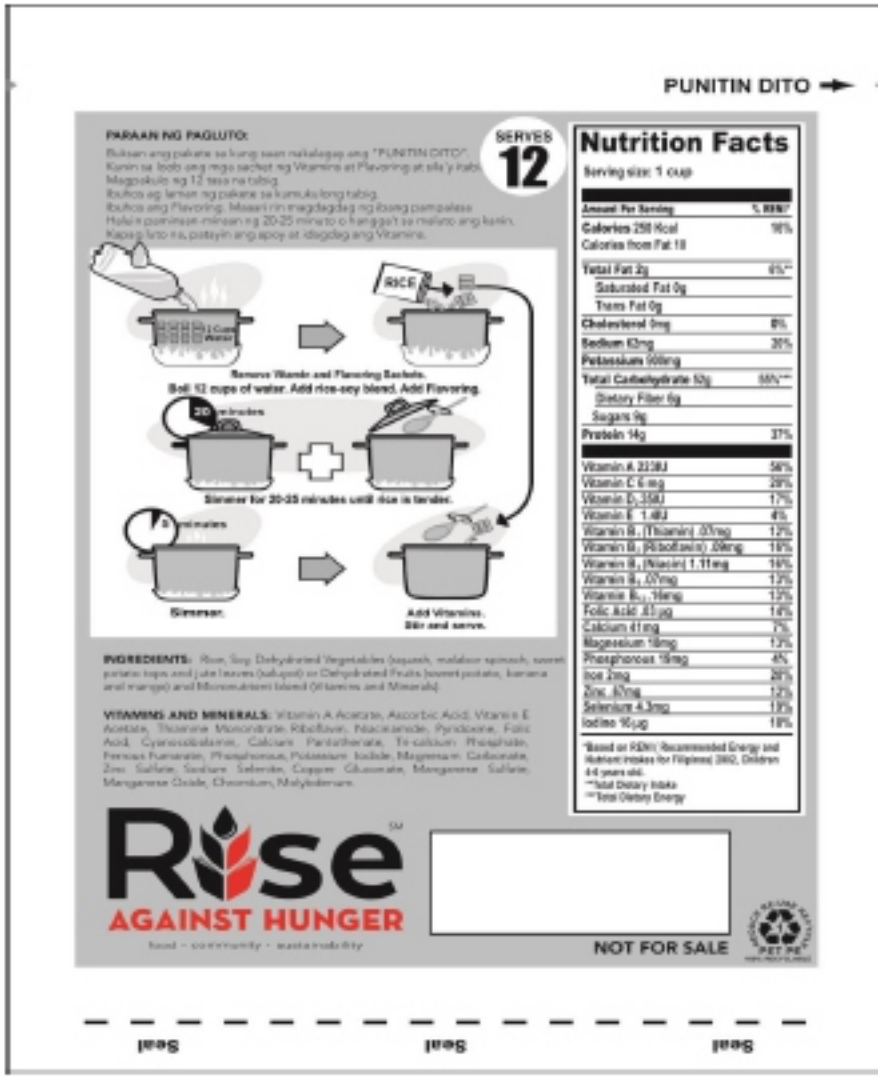


**Figure 1.** *Rise-Soy Meal Pack Recipe (Adapted from: Rise Against Hunger Philippines Orientation Packet for DSP Beneficiaries)*

**Table 1.** *The proportion of preschool children according to weight-for-age classification per child development center.*

| Sex Characteristic in each Child Development Center | Total Number | Age Range (months) | UPON ENTRY (July 2, 2018) | | | | | | | | AFTER 60 DAYS (Sept 24, 2018) | | | | | | | | AFTER 120 DAYS (Dec 10, 2018) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | SU | | UW | | N | | O | | SU | | UW | | N | | O | | SU | | UW | | N | | O | |
| | | | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % | # | % |
| **Wildcat Child Development Center** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Male | 84 | 33-69 | 2 | 2.4 | 7 | 8.31 | 71 | 84.5 | 4 | 4.8 | 0 | 0.0 | 3 | 3.6 | 77 | 91.7 | 4 | 4.8 | 0 | 0.0 | 1 | 1.2 | 79 | 94.0 | 4 | 4.8 |
| Female | 86 | 33-68 | 4 | 4.7 | 11 | 2.8 | 68 | 79.1 | 3 | 3.5 | 2 | 2.3 | 4 | 4.7 | 77 | 89.5 | 3 | 3.5 | 0 | 0.0 | 3 | 3.5 | 82 | 95.3 | 1 | 1.2 |
| **Total** | **170** | | 6 | 3.5 | 18 | 10.6 | 139 | 81.8 | 7 | 4.1 | 2 | 1.2 | 7 | 4.1 | 154 | 90.6 | 7 | 4.1 | 0 | 0.0 | 4 | 2.4 | 161 | 94.7 | 5 | 2.9 |
| **Tomasa Child Development Center** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Male | 79 | 37-60 | 3 | 3.8 | 6 | 7.6 | 65 | 82.3 | 5 | 6.3 | 0 | 0.0 | 4 | 5.1 | 73 | 92.4 | 2 | 2.5 | 0 | 0.0 | 0 | 0.0 | 78 | 98.7 | 1 | 1.3 |
| Female | 80 | 35-60 | 4 | 5.0 | 8 | 10.0 | 67 | 83.8 | 1 | 1.3 | 0 | 0.0 | 5 | 6.3 | 74 | 92.5 | 1 | 1.3 | 0 | 0.0 | 0 | 0.0 | 80 | 100 | 0 | 0.0 |
| **Total** | **159** | | 7 | 4.4 | 14 | 8.8 | 132 | 83.0 | 6 | 3.8 | 0 | 0.0 | 9 | 5.7 | 147 | 92.5 | 3 | 1.9 | 0 | 0.0 | 0 | 0.0 | 158 | 99.4 | 1 | 0.6 |
| **San Jose Child Development Center** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Male | 30 | 36-62 | 2 | 6.7 | 9 | 30.0 | 19 | 63.3 | 0 | 0.0 | 0 | 0.0 | 4 | 13.3 | 26 | 86.7 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 30 | 100 | 0 | 0.0 |
| Female | 30 | 33-58 | 2 | 6.7 | 7 | 23.3 | 21 | 70.0 | 0 | 0.0 | 0 | 0.0 | 4 | 13.3 | 26 | 86.7 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 30 | 100 | 0 | 0.0 |
| **Total** | **60** | | 4 | 6.7 | 16 | 26.7 | 40 | 66.7 | 0 | 0.0 | 0 | 0.0 | 8 | 13.3 | 52 | 86.7 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 60 | 100 | 0 | 0.0 |
| **Ibayo-Usuan Child Development Center** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Male | 33 | 44-53 | 0 | 0.0 | 1 | 3.0 | 31 | 93.9 | 1 | 3.0 | 0 | 0.0 | 0 | 0.0 | 32 | 97.0 | 1 | 3.0 | 0 | 0.0 | 0 | 0.0 | 32 | 97.0 | 1 | 3.0 |
| Female | 27 | 43-58 | 0 | 0.0 | 2 | 7.4 | 25 | 92.6 | 0 | 0.0 | 0 | 0.0 | 2 | 7.4 | 25 | 92.6 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 27 | 100 | 0 | 0.0 |
| **Total** | **60** | | 0 | 0.0 | 3 | 5.0 | 56 | 93.3 | 1 | 1.7 | 0 | 0.0 | 2 | 3.3 | 57 | 95.0 | 1 | 1.7 | 0 | 0.0 | 0 | 0.0 | 59 | 98.3 | 1 | 1.7 |
| **Pusawan Child Development Center** | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Male | 47 | 35-59 | 0 | 0.0 | 3 | 6.4 | 39 | 83.0 | 5 | 10.6 | 0 | 0.0 | 3 | 6.4 | 39 | 83.0 | 5 | 10.6 | 0 | 0.0 | 0 | 0.0 | 42 | 89.4 | 5 | 10.6 |
| Female | 42 | 31-59 | 0 | 0.0 | 4 | 9.5 | 38 | 90.5 | 0 | 0.0 | 0 | 0.0 | 2 | 4.8 | 40 | 95.2 | 0 | 0.0 | 0 | 0.0 | 0 | 0.0 | 42 | 100 | 0 | 0.0 |
| **Total** | **89** | | 0 | 0.0 | 7 | 7.9 | 77 | 86.5 | 5 | 5.6 | 0 | 0.0 | 5 | 5.6 | 79 | 88.8 | 5 | 5.6 | 0 | 0.0 | 0 | 0.0 | 84 | 94.4 | 5 | 5.6 |

SU – Severely Underweight; UW – Underweight; N- Normal; O-Overweight

**Table 2.** *Feeding program beneficiaries per child development center.*

| Child Development Centers | Number of Daycare Children |
|---|---|
| Wildcat | 170 |
| Tomasa | 159 |
| San Jose | 60 |
| Pusawan | 89 |
| Ibayo 93 | 60 |
| **Total** | **538** |

endline assessment, height measurements were not analyzed. Statistical tests, namely McNemar's Test and paired t-test, were used to determine if the proportion of preschool children with improvement in WFA classification after 120-day dietary supplementation and if mean weight difference between Day 0 and Day 120 of dietary supplementation program were statistically significant, respectively. OpenEpi and MS Excel were used to perform the statistical tests mentioned.

## Results

Table 2 shows the number of daycare children (31-61 months) in each child development center who participated in the study.

Out of 538 assisted children, 51 % were males while the remaining 49 % were females.

There was no recorded number of severely underweight children after 120 days of feeding. Majority of preschool children had normal weight-for-age (82.5%) while 10.8% were classified as underweight at baseline (Table 3). Post DSP, it can be noted that the number of undernourished and overweight children declined. Results of McNemar's test showed that the decrease in the proportion of underweight children was statistically significant, p=0.0000001. However, some children who were overweight remained to be overweight. The mean weight of preschool children at baseline was 15.232 ± 3.367 while 16.240 ± 2.725 at endline which means that there was an increase in the mean weight of preschool children after 120 days of the supplementation program (Table 4). A paired t-test revealed that the -1.008 difference in mean weight (95% CI: -1.115 to -0.902) of preschool children between baseline and endline was extremely statistically significant, t(537)=18.5571, p>0.001.

## Discussion

The WFA is considered an important indicator that can inform supplementary feeding planners and implementers that their efforts are paying off. It is the most commonly used nutritional index to monitor the progress of hunger eradication [16,17]. The assessment result showed that the school-based

**Table 3.** *The proportion of preschool children who were severely underweight, underweight, and overweight at baseline and endline (n=538).*

| Nutritional Status* | Baseline | | Endline | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| Severely Underweight (SU) | 17 | 3.5 | - | - |
| Underweight (UW) | 58 | 10.8 | 4 | 0.7 |
| Normal (N) | 444 | 82.5 | 522 | 97.0 |
| Overweight (OW) | 19 | 3.5 | 12 | 2.2 |

* Weight-for-age (WHO Child Growth Standards)

**Table 4.** *Descriptive statistics of weight-for-age of preschool children at baseline and endline.*

| | Baseline | Endline |
|---|---|---|
| Mean | 15.232 | 16.240 |
| SD | 3.367 | 2.725 |
| SEM | 0.145 | 0.117 |
| N | 538 | 538 |

DSP intervention for 120 days yielded positive results in terms of improving the WFA Z-scores of enrolled students in the covered CDC. There was no recorded number of severely underweight children after 120 days of feeding. The RAHP meal packs provided the children with increased access to nutritious food which eventually improved their nutritional status. This finding of improved WFA Z-scores after DSP is consistent with the findings of other studies that evaluated DSP [6,16].

Post DSP, it can be noted that the number of undernourished declined. This finding is contrary to what was obtained by Yamaguchi and Takagi in 2018 where no improvement in the weight of undernourished school children was noted based on their review of a number of DSPs in the Philippines.

Some children who were overweight at baseline maintained their overweight status at the end of the DSP. This is understandable because no feeding mechanism guides the feeding coordinators to help them manage their weight. A similar observation was noted in a review of DSPs done in the Philippines [8]. This is a serious concern since childhood obesity, a form of malnutrition, is a risk factor for developing lifestyle diseases like Type II diabetes and is associated with poorer mental health [11,18].

Supplementary programs should be designed to meet 30-40% of the estimated gap between the child's energy needs and the energy they usually receive from usual meals consumed [7]. Contrary to this recommendation, one-cup serving of RAHP meals was able to provide around 20% of their energy requirement using the Food Composition Table (FCT) [19] computation of cooked meal per serving portion. Dietary assessment can be done in the future to further assess the effect of RAHP blanket DSP on the nutritional status of preschool children.

Based on the evaluation of effectiveness provision stipulated in the 2011 DSP, the RAHP-sponsored 120 days dietary supplementation program for preschoolers enrolled in the five (5) child development center was effective in improving the anthropometric status of the targeted beneficiaries based on the increase in mean weight and improvement in their WFA classification. This outcome can be attributed to the following factors: (a) close attention given by the daycare teachers who also served as the DSP coordinators; (b) regular assistance from the parents of the students who made the porridge delicious; and (c) local barangay health workers who continuously monitor students who missed the feeding session and distributed their ration in their homes.

The DSP guidelines stipulate that the DSP should prioritize severely underweight and underweight children. Due to humanitarian concern, the NGO supported the blanket feeding of all the students enrolled in the CDC. In reality, this provision is difficult to implement in school-based DSP because it was very difficult to adjust the serving sizes for overweight children in the presence of their mothers helping in the distribution of rice meals during feeding sessions. Feeding coordinators expressed the need for guidelines on how they could address this concern as they wanted to help the children who were overweight reduce their weight to normal levels. The national DSP guidelines should recommend feeding mechanisms for children who have normal weight and those who are overweight or obese.

The DSP in the covered CDC was limited to daily provision of meals and limited time was devoted to orienting parents on food safety measures to observe during meal preparation in the CDC and their households. This was contrary to the DSP guidelines which recommend that DSP should implement

complementary activities such as nutrition education classes for mothers, preparation of nutritious and low-cost meal at home, as well as child care and livelihood activities to ensure the households' overall food security. The DSP evaluation could also measure the effect of complementary activities on the nutritional status of beneficiaries.

## Acknowledgments

The authors would like to acknowledge the support of the LGU in Taguig City, Mr. Jose Mariano Fleras of Rise Against Hunger Philippines for funding the DSP, daycare teachers in Ibayo 93, Wildcat, Tomasa, Pusawan, and San Jose CDCs for monitoring the dietary supplementation program and overseeing the collection of anthropometric measurements.

## References

1. World Health Organization. (2016) What is malnutrition. https://www.who.int/features/qa/malnutrition/en/
2. Department of Science and Technology-Food and Nutrition Research Institute. (2015) National nutrition survey 2013. https://www.fnri.dost.gov.ph/images/sources/anthrop_children.pdf
3. World Food Programme. (2014) Target supplementary feeding programme guidelines. https://www.humanitarianresponse.info/system/files/documents/files/TSFP%20Guideline%20for%20CPs_Final.pdf
4. National Nutrition Council. (2017) Philippine plan of action for nutrition 2017-2022: Executive summary. https://nnc.gov.ph/phocadownloadpap/PPAN/18Sept_PPAN2017_2022Executive%20Summary.pdf
5. National Nutrition Council. (2017) Implementing guidelines on dietary supplementation program: Executive summary . In Philippine Plan of Action for Nutrition Implementing Guidelines, S of 2017. Unpublished document.
6. Augusto RA, Pachedo de Souza JMP. (2010) Effectiveness of a supplementary feeding program in child weight gain. Revista de saúde pública. 44. 793-801. doi: 10.1590/S0034-89102010000500004.
7. Kristjansson E, Francis D, Liberato S, *et al.* (2016) Supplementary feeding for improving the health of disadvantaged infants and children: What works and why? London: International Initiative for Impact Evaluation (3ie).
8. Yamaguchi M, Takayi A. (2018) School-based feeding program for undernourished children in the Philippines. The Japanese Journal of Nutrition and Dietetics, V76, Issue Supplement Page S98-S 104.
9. Food and Agriculture Organization. (2019) The state of food security and nutrition in the world. https://www.who.int/nutrition/publications/foodsecurity/state-food-security-nutrition-2019-en.pdf?ua=1
10. Department of Science and Technology-Food and Nutrition Research Institute. (2015) Philippine nutrition facts and figures 2013: Maternal health and nutrition and infant and young child feeding surveys. Taguig City: Food and nutrition Research Institute - Department of Science and Technology.
11. Eggersdorfer M, Kraemer K, Ruel M, *et al.* (2013). The road to good nutrition: A global perspective. asel, Switzerland: Karger Medical and Scientific Publisher.
12. World Health Organization. (2020) Supplementary feeding in community settings for promoting child growth. https://www.who.int/elena/titles/child_growth/en/
13. Maleta K, Kuittinen J, Duggan MB, et al. (2004) Supplementary feeding of underweight, stunted Malawian children with a ready-to-use food. J Pediatr Gastroenterol Nutr. Feb;38(2):152-8. doi: 10.1097/00005176-200402000-00010. PMID: 14734876.
14. University of Lancaster. (2016) Qualitative research. https://www.lancaster.ac.uk/media/lancaster-university/content-assets/documents/learning-skills/quantitativevqualitativeresearchanswers.pdf
15. Gibson RS. (2003) Principles of nutritional assessment. New York: Oxford University Press.
16. Santos I, Gigante D, Coitinho D, Haisma H, Valle N, Valente G. (2005) Evaluation of the impact of a nutritional program for undernourished children in Brazil. ,21(3):776-785. Cadernos de Saude Publica, 21(3):776-785. doi:http://dx.doi.org/10.1590/S0102-311X2005000300011.
17. United Nations. (2016) Sustainable development goals - Goal 2: Zero hunger. http://www.un.org/sustainabledevelopment/hunger/
18. Sahoo K, Sahoo B, Choudhury AK, Sofi NY, Kumar R, Bhadoria AS, *et al.* (2015) Childhood obesity: Causes and consequences. J Family Med Prim Care, Apr-Jun; 4(2), 187-192.
19. Department of Science and Technology-Food and Nutrition Research Institute. (1997) The Philippine food composition tables. Taguig, Metro Manila: Food and Nutrient Research Institute - Department of Science and Technology.