Utilization of Rice Flour, Awak Banana, Red Beans, Herbal Chicken Liver and Feet to Enrich Micronutrients Content of Complementary Food

Jumirah[1,2], Zulhaida Lubis[1] and Maya Fitria[1]
[1]*Faculty of Public Health, Universitas Sumatera Utara, Jl. Universitas No. 21, Kampus USU Padang Bulan Medan, North Sumtera 20155, Indonesia*
[2]*Center of Exellence for Natural Resources-Based Technology, Universitas Sumatera Utara, Medan, North Sumatera 20155, Indonesia*

Keywords: rice flour, awak banana, red bean, herbal chicken liver and feet, complementary food.

Abstract: The prevalence of stunting in a toddler is still quite high. The dominant cause is related to the low acquisition of complementary foods (CF) during the second year, especially in the fulfillment of micronutrients. Therefore, the study of the use of potential food is needed to enrich the nutrient content, especially micronutrients in CF formulations, to overcome the problem of stunting in the first thousand days of children life. This paper discusses the use of rice flour (R), awak banana (Bn), red beans (B), herbal chicken livers (L) and feet (F) in CF formulation. Formulation of CF was carried out through experimental studies using a complete randomized design with three formulas, namely RBnBLF, RBnBF, and RBnBL. The nutrient content was carried out by sending samples to Laboratory in Jogjakarta. The results showed that the third formula CF has a protein content and fat almost the same i.e. respectively 14% and 11%, carbohydrate content 56.1-61.18% and energy 380.56-397.96%, vitamin A as much as 319.99-439.85µg, vitamin C 39.11-54,51mg, calcium 0.51-1.26%, phosphorus 0.37-0.59%, iron 19.69-24,07mg, and Zinc 5.4-6.0mg. It was concluded that the use of several potential foods can enrich the micronutrient content of CF

1 INTRODUCTION

One of the priority programs for improving nutritional status, especially related to the first thousand days of children's life is the need to improve the quality of complementary feeding (CF). This will also be closely related to programs to achieve optimal growth for children in Indonesia. As it known that nutritional problems in children under five, especially stunting problem that is still relatively high.

The results of the Basic Health Research in 2018 reported that the prevalence of stunting in children under five had decreased by 30.8% compared to the result of the Basic Health Research in 2013 i.e. amounting to 37.2%, and prevalence of wasting decreased from 12.1% to 10.2% (Kemenkes RI, 2013; Kemenkes RI, 2018).

The prevalence of stunting in children under two years according to the results of the Basic Health Research in 2018 was also relatively high at 29.9% (Kemenkes RI, 2018). The magnitude of the nutritional problem according to Onis et al. (2018), the nutritional problem of the people in Indonesia is categorized as acute and chronic. The results of Nutritional Status Monitoring Survey in 2017 showed that nutritional problems in children aged 0-23 months in Indonesia are categorized as high based on the prevalence of wasting (Weight/Length indicators) which was 12.8%, and based on the prevalence of stunting (Length/Age indicators) which was 20.1%.

The problems that occur in children under five, especially in the age group 0-23 months must be a priority response. This is related to the adverse effects that can be caused by these nutritional problems both in the short term and in the long term. Short-term impacts that occurred among other disorders of brain development, intelligence, physical growth, and metabolic disorders. While the long-term impact of which may result in a decrease in cognitive abilities and learning achievement,

Jumirah, J., Lubis, Z. and Fitria, M.
Utilization of Rice Flour, Awak Banana, Red Beans, Herbal Chicken Liver and Feet to Enrich Micronutrients Content of Complementary Food.
DOI: 10.5220/0008554003320338
In *Proceedings of the International Conference on Natural Resources and Technology (ICONART 2019)*, pages 332-338
ISBN: 978-989-758-404-6

decreased immune system so ease pain, and at high risk for the emergence of degenerative diseases.

Stunting problems in children can be caused by various factors, such as the adequacy of nutrients in the mother's womb which is reflected in the weight and length of the child at birth, and the level of fulfilment of nutritional needs, especially during the first two years of life known as the golden period. Nutritional needs in that period should ideally be fulfilled from the breast feeding in the form of exclusive breastfeeding and CF. Suggestions for infant's complementary feeding must be adapted to nutritional needs, digestive system capabilities and safety aspects.

Problems in providing CF in the community, most of which are unable to meet the nutritional needs of babies, especially protein and micronutrients needed to support the growth process of the baby's body length. The results of the Basic Health Research in 2018 reported that only 46.6% of children aged 6-23 months were given a variety of foods, consisting of 4 or more types of food from 7 recommended food groups (Kemenkes RI, 2018).

In this paper, the researcher will present the results of research on the use of rice flour and awak banana ripes as CF which are varied with red beans and herbal chicken liver and feet to enrich the micronutrient content. This is in accordance with WHO (2008) recommendations that minimum dietary diversity for children aged 6-23 months is at least consisting of 4 types of 7 types of food groups that are: 1) grains, roots, and tubers; 2) legumes and nuts; 3) dairy products (milk, yogurt, cheese); 4) flesh foods (meat, fish, poultry and liver/organ meats); 5) eggs; 6) vitamin-A rich fruits and vegetables; 7) other fruits and vegetables. The recommendations of WHO with regard to efforts to meet the needs of micro-nutrients on children aged 6-23 months. Regarding the issue of minimal dietary diversity for children aged 6-23 months, WHO (2017) recommends a revision of a minimum dietary diversity of 5 out of 8 types of food groups, namely by adding breast milk as one of the food groups infants aged 6-23 month.

2 RESEARCH METHODS

2.1 Experimental Design

This study was an experiment with a completely randomized design, using 3 treatments, that was:1) a mixture of rice flour and awak banana ripes varied by the addition of the flour a mixture of red bean,herbal chicken liver and feet (RBnBLF), 2) a mixture of rice flour and awak banana ripes varied by adding a mixture of red bean flour and herbal chicken feet (RBnBF), and 3) a mixture of rice flour and awak banana ripes varied by adding a mixture of red bean flour and herbal chicken livers (RBnBL). The study was conducted at Public Health Sciences Laboratories of Faculty of Public Health, University of Sumatera Utara. The time of the research was conducted from June to November 2018.

2.2 Tools and Materials

In this study used the materials i.e. ripe awak bananas, rice flour, feet and liver of herb chicken, dried red beans, sugar, milk powder, vegetable oil, carrot, water and salt. While the tools used include drying oven, sink, bucket, knife, steamer, Healthy mix blender, stirrer, airtight containers, small pans, plates and spoons, and gas stove.

2.3 Stages of Research

The research was conducted in several stages. The first stage was the creation of instant porridge formula of raw materials namely rice flour, flour awak banana riped, red bean flour and flour of feet and liver herbal chicken. Awak banana riped flour made according to Jumirah et al. (2013).

The second stage was the formulation of products with 3 treatment: first used of ripe awak banana flour of 30% by adding mixture of red bean with feet chicken herb flour of 20%, and mixture of red bean with liver chicken herb flour of 20%; second used of ripe awak banana flour of 30% by adding mixture of red bean with feet chicken herb flour of 40%; third used of ripe awak banana flour of 30% by adding mixture of red bean with liver chicken herb flour of 40% Each treatment was given an additional 10% sugar flour, milk powder 10%, and 5% vegetable oil, carrot 5% and salt.

The third stage is the analysis of nutrient composition which includes the proximate content, energy and micronutrients. Nutritional analysis activities are carried out by sending samples to the chemistry laboratory of PT Chemmix Pratama in Jogjakarta.

3 RESULTS AND DISCUSSION

3.1 Nutritional Composition of CF Formulas.

In this study using natural ingredients available in the market were awak banana, rice, red beans, liver and feet of herbal chicken. The formulation is also using additional food ingredients such as carrots and celery that is intended to cover the sharp taste of the liver and chicken feet, milk flour to give the flavor and contributed a number of nutritional substances, vegetable oil and sugar to add fat and sweetness. The use of these ingredients at the same time increases the dietary diversity for complementary feeding.

3.1.1 Proximate and Energy Contents.

Proximate analysis results including water content, ash, protein, fat, crude fiber and carbohydrates, and the energy content in the CF formulation of a mixture of awak banana ripes with rice flour, red beans, feet and liver of herbal chicken are shown in Table 1.

Based on the moisture content of the three formula of CF indicated that the RBnBL formula has the highest percentage (6.86%) and the RBnBF formula has the lowest percentage (4.22%).

The requirements of moisture content of instant powder CF according to the Decree of the Minister of Health of the Republic of Indonesia number 224/Menkes/SK/II/2007 and the Regulation of Drug and Food Supervisory Agency No. 1 year 2018 (BPOM R.I., 2018) respectively by 4% and 5%, so that the three of CF formulas obtained have higher water content than the number recommended by Minister of Health of the Republic of Indonesia number 224/Menkes/SK/II/2007.

Table 1: Nutritional composition based on proximate analysis and energy of the CF formulas mixture of awak banana flour with red beans, herbal chicken liver and feet.

Composition of Nutrients	CF Formulas (100 g sample)		
	RBnBLF	RBnBF	RBnBL
Moisture (%)	4.66	4.22	6.86
Ash (%)	2.67	3.46	2.29
Protein (%)	14.07	14.34	14.41
Fat (%)	11.31	11.03	11.17
Crude Fiber (%)	6.12	8.22	8.66
Carbohidrat (%)	61.18	58.74	56.61
Energy (kcal/gr)	397.96	387.14	380.56

Description:
RBnBLF= mixture of rice flour,awak banana, red beans, feet and liver of chicken herbal
RBnBF= mixture of rice flour,awak banana, red beans, and chicken herbal feet
RBnBL= mixture of rice flour,awak banana, red beans, and liver of chicken herbal

Based on the analysis of the energy content of the complemnentary feeding formula, the highest content was found in the RBnBLF formula, which was 397.96 kcal and the lowest was in the RBnBL formula of 380.56 kcal. Estimated energy density of the CF formula is obtained between 3.8056-3.9796 kcal/g. The Regulation of Drug and Food Supervisory Agency No. 1 year 2018 (BPOM RI, 2018) requires that the value of energy density in CF ready for consumption for infants aged 6-12 months be at least 0.8 kcal/g, so that it can be stated that the three CF formulas have energy density according to the requirements of the Regulation of Drug and Food Supervisory Agency No. 1 year 2018 (BPOM RI, 2018).

The Regulation of Drug and Food Supervisory Agency No. s at least of CF for infants aged 6-12 months 240 kcal/day. Based on the value of the benchmark, an estimated per day of a baby can consume as much as 65 g/day CF, which has the lowest energy content as much as 247.36 kcal/day and the highest of 258.67 kcal\/day.

Thus it can be stated that the energy content and energy density of the three CF formulas have met the requirements of The Regulation of Drug and Food Supervisory Agency No. 1 year 2018 (BPOM RI, 2018).

The protein content of the CF formulas is between 14.07% and 14.41%, where the highest levels is found in the RBnBL formula and the lowest is in the RBnBLF formula. When compared with the requirements of CF protein content of instant powder according to the Indonesian Ministry of Health in 2007, which is between 15-22%, then the three types of formulas do not meet the requirements

Based on the Regulation of Drug and Food Supervisory Agency No. 1 of 2018 (BPOM RI, 2018) it is stated that the minimum protein content of the staple CF of 1.9 g/100 kcal and a maximum of 5.5 g/100 kcal, or every 240 kcal the CF (minimum energy from basic CF per day for babies aged 6-12 months) must contain as much as 4.56 g. If it is assumed the baby consumes 65g of CF to meet energy needs of at least 240kcal, then contributing 9.15g of protein comes from the RBnBLF formula.This amount is in accordance with what is recommended in the Regulation of Drug and Food Supervisory Agency No. 1 of 2018 (BPOM R.I., 2018). Thus it can be stated that the three CF

formulas meet the requirements in terms of the amount of protein content.

The highest fat content was 11.31% in the RBnBLF formula and the lowest was in the RBnBF formula which was 11.03%. This is in accordance with the CF fat content requirements according to the Indonesian Minister of Health Decree in 2007 which is 10-15% and also base on the provisions of the Regulation of Drug and Food Supervisory Agency No. 1 of 2018 (BPOM R.I, 2018) which is 4.5% every 100 kcal/day. If it is assumed that infants consume CF as much as 65g/day with the highest energy content in the RBnBLF formula (as much as 397.96 kcal), then it will contribute energy of 258,674 kcal/day and fat of 7.35 g.

Based on the benchmark that the baby is at least taking 240 kcal/day and fat by as much as 10,8 g/day, then if baby consumes as much energy 258.67 kcal/day should have fat content of CF according to the Regulation of Drug and Food Supervisory Agency No. 1 of 2018 (BPOM R.I, 2018) that is as much as 11,64 g/day. Thus the fat content on the CF formula is still in the allowable limits.

The highest carbohydrate content is found in the RBnBF formula, which is 61.18% and the lowest is in the RBnBL formula which is 56.61%. The Regulation of Drug and Food Supervisory Agency No. 1 of 2018 (BPOM R.I., 2018) stipulates that the sugar addition of sucrose, glucose and fructose is not more than 5 g/100 kcal. In this study, the process of making CF formula using sucrose by 10%, meaning that in 100g CF there is as much as 10g of sugar and contains the highest calories as much as 397.96 kcal.

Based on the calculation that if the daily energy intake is 258.67 kcal, there is 6.5 g/day of sucrose which has fulfilled the provisions of the Regulation of Drug and Food Supervisory Agency No. 1 of 2018 (BPOM R.I., 2018), namely by benchmarking a minimum energy content of 240 kcal/day and sugar as much as 12g/day.

3.2 Micronutrient Contents.

Micronutrient composition includes vitamins and minerals. In this study the vitamins analyzed included vitamin A and vitamin C, while the minerals analyzed included calcium, phosphour, iron, and zinc.

The vitamin A content calculated as betacrotene is relatively high in the three CF formulas, namely 1919.92-2639.12 µg, assuming that 1µg retinol is equivalent to 6µg betacarotene, so the content of vitamin A as retinol is 270.28-581.105 µg. In the Regulation of Drug and Food Supervisory Agency No. 1 of 2018 (BPOM R.I., 2018) mentioned that the addition of vitamin A as many as 60-180 µgRE/100kcal on staples and snacks CF for infants aged 6-12 months. Based on the reference, if the baby is consuming a minimum of 240 kcal/day then vitamin A minimum that must be contained in CF that is as much as 144 µg and in 65 g CF will contribute vitamin A as much as 465.61 µg. Based on the results of these calculations it can be stated that the vitamin A content of the CF formula is in accordance with the figures specified by the Regulation of Drug and Food Supervisory Agency No. 1 of 2018 (BPOM R.I., 2018).

Table 2: Micro nutrients composition of CF formula mixed of rice flour, awak banana, red beans, herbal chicken liver and feet.

Micronutrient Composition	CF Formulas (100 g sample)		
	RBnBLF	RBnBF	RBnBL
Vitamin A (µgRE)	1919.92	1982.15	2639.12
Vitamin C (mg)	48.23	39.11	54.51
Calcium (%)	1.26	1.10	0.51
Phosphorus (%)	0.56	0.59	0.37
Iron (mg)	19.69	20.88	24.07
Zinc (mg)	5.55	6.00	5.40

The lowest vitamin C content is found in the RBnBF formula, which is 39.11 mg and the highest is found in the formula RBnBL 54.51 mg. The Regulation of Drug and Food Supervisory Agency No. 1 of 2018 (BPOM R.I., 2018) requires the addition of vitamin C at least 2.7 mg/100 kcal. If the baby is assumed to be consuming CF as much as 65 g will then donate as much vitamin C 25,42mg/day. This number meets the requirements of the Regulation of Drug and Food Supervisory Agency No. 1 of 2018 (BPOM R.I., 2018) which is estimated at 6.48mg/day based on minimum energy and vitamin C content in staples and snacks CF for babies aged 6-12 months.

In Table 2 show that the lowest number of calcium and phosphour content of CF formula i.e. each of 0.51% calcium or as much as 510 mg and 0.37% phosphour or as much as 370 mg, and the highest number i.e each amounting to 1.26% calcium or as much as 1,260 mg and 0.59% phosphour or as much as 590mg.

The table also shows that the CF formula with the addition of herbal chicken feet has a relatively high calcium content (RBnBLF 1.26% and RBnBF 1.10%) and more than the CF formula with the addition of herbal chicken liver (RBnBL0.51%).

Likewise, the phosphour content of the CF formula that uses herbal chicken feet is relatively higher compared to the CF formula which uses herbal chicken liver.

Referring to Regulation of Drug and Food Supervisory Agency No. 1 of 2018 which requires the obligation to add 80mg of calcium and phosphour as much as 67.5mg/100kcal in the main and snacks CF. Based on the calculation if the CF contains at least 240kcal/day of energy, the minimum calcium and phosphour content per day is 192 mg and 162 mg respectively. Based on an estimate that per day infants consuming 65 g CF with the energy content as much as 247.36 kcal, then the lowest calcium will donate as much as 331,5 mg and the highest as much as 819mg, will also donate the lowest phosphour as much as 240, 5 mg and the highest as much as 383,5 mg.

The Regulation of Drug and Food Supervisory Agency No.1 of 2018 (BPOM R.I, 2018) determines the ratio of calcium and phosphorus content of CF to not less than 1.2 and not more than 2. Based on the calculation of the ratio of calcium and phosphorus content in the CF formula, those that meet the Regulation of Drug and Food Supervisory Agency No.1 of 2018 requirements are RBnBL and RBnBFformulas with a value ratio of 1.37 and 1.86.Based on the results analysis of the formula RBnBLF has a ratio of 2.25 so that it does not meet the Regulation of Drug and Food Supervisory Agency No.1 of 2018 (BPOM R.I, 2018) requirements.

The results of the analysis in Table 2 show the lowest iron and zinc content as much as 19.69 mg and 5.40 mg per 100 g CF and the highest content respectively of 24.07mg and 6.0mg. Bean contains iron higher than cereal staples (Beebe et al. 2000; Blair et al. 2010), so that it can increase the iron content in baby food formulas. The Regulation of Drug and Food Supervisory Agency No.1 of 2018 (BPOM R.I, 2018) requires mandatory add iron and zinc on CF each as much as 3.56mg and 0.86mg/100kcal. Based on a minimum energy standard of 240kcal per day, iron and zinc which must be added are 8.54mg and 2.06mg respectively. If it is assumed that babies consume 65g of CF and contain as much as 247.36 kcal of energy, then it can contribute iron and zinc at least 12.8mg and 3.51mg per day respectively and a maximum contribution of 15.65mg and 3,9 mg per day. So it can be stated that the iron and zinc content in the three CF formulas meet the requirements of the Regulation of Drug and Food Supervisory Agency No.1 of 2018 (BPOM R.I, 2018).

The results of this study prove that CF formulations which are designed using a mixture of several types of plant and animal foods can enrich the nutrient content, especially micronutrients that are needed for the growth and development of infants.Thus it can be stated that the CF formulation produced in this study will support the WHO recommendations listed in the SDG's framework (Korenrom et al. 2014), that is an attempt to achieve sufficiency dietary diversity indicator of children aged 6-23 months that is given at least 4 types of 7 food groups. The achievement of these indicators is expected to be able to reduce the problems of stunting and wasting, as revealed by IFPRI (2014) and is a recommendation for accelerating indicators for the growth and nutrition of children (WHO/UNICEF/ USAID/AED/FANTA-2, 2010).

Food ingredients used in the formulation of CF is a combination of a natural source of nutrients. Awak banana ripes rich in glucose, potassium, vitamin B6, vitamin A, inulin and oligosaccharides (Jumirah et al. 2013). Red beans, are magnificent sources of the essential nutrients i.e. energy, proteins, carbohydrates, minerals and vitamins (Rehman & Shah 2004; Yin et al. 2008). These beans contains 22.7 % protein, 3.5 % mineral, 1 % fat and 57.7 % carbohydrates out of which total carbohydrates have, 38.6 % starch and 18.8 % dietary fiber (60 % insoluble and 40 % soluble). Its protein has highest lysine content about 5 % (Qayyum et al. 2012). Red bean has the amino acid profile is excellent especially rich in lysine, leusin, aspartic acid, glutamic acid and arginine. Its provide the optimum amount of essential amino acids when used with cereals and other sulfur-containing products (Boye et al. 2010). The glutamic and aspartic acids are mainly acidic in nature and present in raw as well as processed beans. According to Audu and Aremu (2011), red beans provide 10.2g glutamic acid, 9.5g aspartic acid, 1.2g cysteine, 1.7 g methionine, 3g histidine, 4.4g alanine, 5.2 g glycine, 3.4g threonine, 3.3 g proline, 3,7 g isoleucine, 3.1 g tyrosine, 4.6 g phenylalanine, 4.1 g valine, 3.1 g serine, 6.9 g arginine, 7 g lysine and 7.2 g leucine per 100 g. Red beans are best source of vitamin B group, essential minerals like K, Ca, Mg, P and iron ~~too~~ (Souci et al. 2000). Red beans can be a potential ingredient for use in foods that are nutraceutical and functional food. It may be useful in correcting chronic diseases that have affected masses throughout the world (Shehzad et al. 2015)

The chicken feet contain energy, protein, vitamin A, folic acid, kholin, calcium, phosphour, omega three and omega six fatty acids, collagen and cartilage (Source: www.nutritionvalue.org/Chicken%2C

boiled%2C_feet_nutritional_value.html). A number of important nutrients such as protein, vitamins and minerals are found in chicken liver with a fairly high content (Joseph, 2018). In addition, the use of liver and feet herbal chicken has a better safety value compared to liver and feet of broiler in general, because in the process of herbal chicken farming does not use chemicals as is common in broilers which are widely sold in the market.

According to Santika et al. (2009), chicken feet are one type of animal protein source consumed by children aged 9-11 months in Indonesia.

Complementary feeding formulations consisting of a mixture of awak banana ripes, rice flour, red beans, herbal chicken liver and feet, resulting in a more complete nutritional composition and have the characteristics of a good organoleptic, so that it can be used as a choice of complementary feeding which is useful to meet the nutritional needs of infants.

4 CONCLUSIONS

Rice flour and riped awak banana in CF formulations which are varied with herbal chicken liver and feet is a combination of food ingredients that can meet the recommended minimum dietary diversity for children aged 6-23 months. Complementary feeding formulation can enrich the nutrients content, especially micronutrients such as calcium, phosphorus, iron, zinc, vitamin A and the other miconutrients that are needed for the growth and development of children aged 6-23 months.

ACKNOWLEDGEMENTS

The research was funded by the Directorate of Research and Community Service of the Directorate General for Research and Development of the Ministry of Research, Technology and Higher Education in accordance with the agreement of funding Research and Community Service at 2018.

REFERENCES

Audu, S.S., Aremu, M.O., 2011. Effect of Processing on chemical composition of Red Kidney Bean (*Phaseolus vulgaris L.*) Flour. *Pak. J. Nutr. 10:1069-1075*

Badan Pengawas Obat dan Makanan Republik Indonesia (BPOM R.I). 2018. Peraturan Badan Pengawas Obat dan Makanan Nomor 1 Tahun 2018 Tentang Pengawasan Pangan Olahan untuk Keperluan Gizi Khusus .[In Indonesia]

Beebe, S.; Gonzalez, A.V.; Rengifo, J., 2000. Research on trace minerals in the common bean. *Food Nutr. Bull. 21, 387–391*

Blair, M.W.; Medina, J.I.; Astudillo, C.; Rengifo, J.; Beebe, S.E.; Machado, G.; Graham, R. 2010. QTL for seed iron and zinc concentration and content in a mesoamerican common bean (Phaseolus vulgaris L.) population. *Theor. Appl. Genet. 121, 1059–1070*

Boye, J.I., F. Zare and A. Pletch. 2010. Pulse proteins: processing, characterization, functional properties and applications in food and feed. *Food Res. Int. 43:414- 431*

China Nutraceuticals Tradeshow. Chicken, boiled, feet nutrition facts and analysis per serving. https://www.nutritionvalue.org/Chicken%2C_boiled%2C_feet_nutritional_value.html citation at 30th April 2019

IFPRI. 2014. Global Nutrition Report 2014: Actions and Accountability to Accelerate the World's Progress on Nutrition. Washington DC: International Food Policy Research Institute & World Health Organization Dept. Of Nutrition For Health And Development.

Joseph Michael. 2018. Chicken Liver 101: Nutrition Facts and Health Benefits. Available At: https://www.Nutritionadvance.Com/Chicken-Liver-Nutrition, Last Updated On October 1, 2018

Jumirah, Zulhaida Lubis, Albiner Siagian, 2013. The formulation of the ripe awak banana flour as the basic ingredient of complementary feeding and its nutritional content analysis. Proceedings C: Symposium on the latest research on food and nutrition, the field of product innovation, quality and food safety ,June 27th 2013.

Kemenkes RI. 2013. Basic Health Research (Riset Kesehatan Dasar/RISKESDAS). Health Research and Development Agency of the Ministry of Health of Republic of Indonesia. Jakarta.

Kemenkes RI., 2018. Basic Health Research (Riset Kesehatan Dasar/RISKESDAS). Health Research and Development Agency of the Ministry of Health of Republic of Indonesia. Jakarta.

Korenrom, Eline, and Marzella Wüstefeld. 2014. Accountability for the Measurement of Results in Nutrition in the post-2015 SDGs. DRAFT Targets and Indicators for the Post-2015 Sustainable Development Goals. United Nations System/Standing Comittee on Nutrition. This report is also available at the UNSCN website at www.unscn.org.

Onis M, Borghi E, Arimond M, Webb P, Croft T, Saha K. 2018. Prevalence thresholds for wasting, overweight and stunting in children under 5 years. *PublicHealth Nutrition*. doi:10.1017/S1368980018002434.

Qayyum, M.M. N., M.S. Butt and F.M. Anjum., 2012. Composition analysis of some selected legumes for protein isolates recovery. *J. Ani. Plant Sci. 22:1156-1162*.

Rehman, Z.U., Shah W.H., 2004. Domestic processing effects on some insoluble dietary fibre components of various food legumes. *Food Chem, 87: 613–617*

Santika O., Fahmida, U., Ferguson., EL. 2009. Development of Food-Based Complementary Feeding Recommendations for 9- to 11-Month-Old Peri-Urban Indonesian Infants Using Linear Programming. *The Journal of Nutrition* 139: 135–141. Downloaded from https://academic.oup.com /jn/articleabstract/139/1/135/4750873 by guest on 09 December 2018

Shehzad, A., Chander, U.M., Sharif, M.K., Ansari, A.R.A., and Muhammad Zuhair Shuja., 2015. Nutritional, functional and health promoting attributes of red kidney beans; A review. *Pakistan Journal of Food Sciences, Volume 25, Issue 4, Page(s): 235-246*.

Souci, S.W., Fachmann, W., Kraut, H., 2000. Food composition and nutrition tables. Stuttgart: Medpharm Scientific Publishers

WHO. 2008. World Health Organization. Indicators for assessing infant and young child feeding practices 2008 [PartI:definition]. Available from :http://www.who. int/maternal_child_adolescent/documents/9789241596664/en/.

WHO, 2017. Global Nutrition Monitoring Framework: Operational Guidance For Tracking Progress In Meeting Targets For2025. World Health Organization, Geneva. Available at https://Apps.Who.Int /Iris/Bitstream/Handle/10665/259904/9789241513609=eng.Pdf

World Health Organization, Unicef, Usaid, Academy For Educational Development (AED), Food and Nutrition Technical Assistance Project (FANTA-2). 2010. Indicators for Assessing Infant and Young Child Feeding Practices. Geneva. http://www.Who.Int /Nutrition/Publications/Infantfeeding/9789241596664/En/ /

Yin, S.W., C.H. Tang, Q.B. Wen, X.Q. Yang, and L. Li. 2008. Functional properties and in vitrotrypsin digestibility of red kidney bean (Phaseolus vulgaris L.) protein isolate: effect ofhigh-pressure treatment. Food Chem. 110: 938-945.