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## Fish-Based Recipes

Promoting the consumption of nutrient-rich small fish species in Zambia



# Fish-Based Recipes

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# Foreword

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Appropriate and adequate dietary intake for pregnant and lactating women and also infants and young children is critical for optimal child growth and development. The Global Strategy for Infant and Young Child Feeding promotes practices that boost the health and nutritional status of infants and young children (WHO 2003). Since the nutritional status of children is closely linked to that of their mothers, appropriate infant and young child feeding (IYCF) begins with ensuring optimal health and nutrition among women throughout all stages of life. Recommended IYCF practices include

- early initiation of breastfeeding within one hour of birth;
- breastfeeding exclusively for the first six months of life;
- introduction of adequate, safe and proper semi-solid and solid foods at six months of age;
- continued breastfeeding up to and beyond 2 years of age.

The frequency, quantity and quality of food consumed during pregnancy, lactation, infancy and childhood must be appropriate to ensure improved nutritional status. Fish contains a significant quantity of micronutrients, essential fatty acids and protein, all of which make it a valuable food to improve diets among women and children. Fish consumption is especially important during the first 1000 days of a baby's life, because the nutrients it provides promote optimal brain development.

This booklet serves as a guide for staff from government agencies and nongovernmental organizations to integrate fish-based recipes into nutrition programs that aim to improve dietary and child feeding practices in Zambia. The nutritional needs of pregnant and lactating women and their infants and young children were central to the development of this booklet, which focused on the role of small fish species in maternal and child nutrition. The recipes can be modified based on the seasonal availability of foods.



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# List of abbreviations

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EAR	Estimated Average Requirement: The average daily nutrient intake level estimated to meet the requirements of half of the healthy individuals in a group.
RDA	Recommended Daily Allowance: The average daily dietary intake level sufficient to meet the requirements of nearly all (97–98 percent) healthy individuals in a group.
AI	Adequate Intake: For healthy breastfed infants, the AI is the mean intake. The AI for other life stages and gender groups is believed to cover the needs of all healthy individuals in the group, but a lack of data prevents being able to specify with confidence the percentage of individuals covered by this intake.
ALA	Alpha-linolenic acid
DHA	Docosahexaenoic acid
EPA	Eicosapentaenoic acid
DPA	Docosapentaenoic acid

# Background

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This booklet contains five fish-based recipes for pregnant and lactating women, and infants and young children as well as other members of the household. These recipes were developed and tested during 2015–2016 in the Mbala and Luwingu districts in Northern Province, Zambia, under the Irish Aid Local Development Programme.

Each recipe includes small fish species, which are rich in minerals, vitamins, protein and essential fatty acids. These species are especially important for meeting the nutrient needs of pregnant and lactating women and also children 6–23 months of age in the first 1000 days of life, which are the most critical. The recipes were developed to meet the specific nutritional needs of these target groups, but they are beneficial to all household members. They are based on local food availability and preferences and are relatively affordable for rural and urban consumers. The ingredients included can be grown or purchased in local markets.

The recipes were rated highly for their overall acceptability, taste, odor, texture and appearance in sensory testing with pregnant and lactating women, children under 2 years of age and men from rural areas in the Mbala and Luwingu districts. Nutrient analyses were also carried out on the five fish-based recipes and the results are included in the Appendix. WorldFish led the development and testing of these recipes, together with several national and district stakeholders, including staff from the Ministry of Health; Ministry of Agriculture, Ministry of Fisheries and Livestock; World Vision; and Self Help Africa. Funding to carry out the research was provided by Irish Aid. Although this booklet was developed in Northern Province, Zambia, these recipes can be used throughout the country where small fish species are accessible to promote the consumption of fish-based foods during the first 1000 days of life.

# Introduction

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The consumption of fish during the first 1000 days is positively associated with increased growth and cognitive development and therefore with improvement in the overall health and nutritional status of women and children. In Zambia, fish is a popular and relatively accessible and affordable animal source food. Northern Province, for example, is an important regional production zone and trade corridor for small pelagic fish species known as *kapenta* and *chisense*. *Kapenta* is a mixture of *Limnothrissa miodon* and *Stolothrissa tanganicae* and is found in Lake Tanganyika (as well as Lake Kariba and Lake Itzhi-Tezhi). *Chisense* is a mixture of *Potamothrissa acutirostris*, *Microthrissa stappersii* and *Poecilothrissa moeruensis* and is found in Lake Bangweulu (as well as Lake Mweru and Lake Mweru-wa-Ntipa). Another important small fish species found in the province (via importation) is *Rastrineobola argentea* (known as *dagaa* in Tanzania), a small pelagic cyprinid found in the Lake Victoria area, East Africa.

Small fish species hold potential to improve nutrition. When eaten whole, they are particularly rich in micronutrients like calcium, vitamin A, iron and zinc, all of which play important roles in child development and growth. Dried small fish is accessible among households of low socioeconomic status in Zambia since it can be purchased at local markets in small quantities and at low costs. It can also be transported and stored relatively easily. Moreover, among household members, dried *kapenta* and *chisense* are often divided more evenly than larger fish or other animal source foods. This shows that increasing access to dried small fish has the potential to improve the intake of essential nutrients among women and children (Longley et al. 2014).

However, despite recognition of the importance of small fish species in Zambia, small fish have not been systematically used in food and nutrition security interventions in the province or other areas of the country. WorldFish and other stakeholders therefore undertook two studies to develop and test food recipes that incorporate small fish species in the Mbala and Luwingu districts. The main output of these studies is this booklet of fish-based recipes, which is intended for staff of ministries and nongovernmental organizations that provide health, nutrition and agriculture extension services in rural Zambia. The cost to produce each of the fish-based recipes is mentioned and may differ depending on prices of ingredients within an area. This booklet can be used alongside other resources, such as the Improved Complementary Foods Recipe Booklet from the National Food and Nutrition Commission of Zambia (NFNC), to promote optimal dietary and feeding practices in the first 1000 days of life.

# Processing ingredients

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The ingredients used in these recipes may be prepared in advance to reduce the cooking time and then stored for use when needed. If prepared in bulk and stored, the ingredients must be placed in clean and airtight containers and kept in dry places in the house to reduce spoilage and contamination from pests. Below is the preparation method for each ingredient.

## **Fish powder**

- Use small fish that are available and affordable (e.g. *kapenta*, *chisense* and *dagaa*).
- Roast dried small fish for 30 minutes over low heat.
- Cool the fish.
- Pound using a mortar and pestle.
- Sieve to a uniform particle size.

## **Bean powder**

- Sort beans, removing stones and moldy or rotten beans.
- Wash beans thoroughly in clean water.
- Soak beans for 2 hours, then drain.
- Boil in water for 10 minutes.
- Sun-dry beans for 2 to 3 days.
- Coarsely pound beans with a mortar and pestle.
- Sieve well to remove larger grains.

## **Pounded groundnut**

- Sort groundnuts, removing all discolored and moldy nuts.
- Sun-dry the groundnuts, then roast and peel them.
- Grind nuts in mortar.
- Use a grinding machine or grinding board to make the nuts into a smooth paste.

## **Soybean flour**

- Boil soya beans in water for 5 minutes then remove from water and cool.
- Dry the soya beans.

- Pound them using a mortar and pestle.
- Sieve the flour to a uniform particle size.

## **Green leafy vegetable powder**

- Sun-dry vegetables for 1 to 2 days.
- Pound the vegetables with a mortar and pestle.
- Sieve the vegetables to a uniform particle size.

## **Mushroom powder**

- Sun-dry mushrooms for 3 to 4 days.
- Pound the mushrooms with a mortar and pestle.
- Sieve the mushrooms to a uniform particle size.

## **Sweet potato flour**

- Peel and thinly slice (about 2 mm) the sweet potatoes.
- Dip them in hot water for 3 minutes then drain excess water.
- Sun-dry the sliced sweet potatoes for 3 to 4 days.
- Pound them using a mortar and pestle.
- Sieve to a uniform particle size.

## **Ground millet**

- Soak millet in water.
- Grind the grains with a stone.
- Winnow the grains.
- Moisten the grains a second time.
- Grind the grains again to break them up into flour, or bring to a hammer mill.



### **Sorghum meal**

- Soak sorghum in water.
- Pound grains with a mortar and pestle to de-hull the grains.
- Winnow the grains.
- Moisten the grains a second time.
- Pound the grains again to break them up into flour, or bring to a hammer mill.

### **Maize meal**

- Husk the maize.
- Clean the grains and discard any unwanted materials.
- Use a mortar and pestle to de-hull the grains.
- Winnow the maize.
- Soak the maize, then wash and dry it.
- Pound the maize or take it to a hammer mill.

### **Onion and garlic powder**

- Cut onion and garlic into pieces.
- Add 3 tablespoons of vegetable oil to a pan.
- Fry the onion and garlic for 15 minutes on low flame until brown while stirring continuously.
- Cool and then pound the onion and garlic.
- Sieve the onion and garlic to a uniform particle size.

### **Turmeric powder**

- Sun-dry turmeric for 3 to 4 days.
- Pound with a mortar and pestle.
- Sieve the powder to a uniform particle size.

### **Chili powder**

- Sun-dry chili for 1 to 2 days.
- Pound with a mortar and pestle.
- Sieve the powder to a uniform particle size.

# Measurements and cooking tools

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The local measurements used in the recipes include cups, tablespoons and teaspoons. The cup sizes vary at the household level from 150 to 500 ml. The one used in this book is 400 ml. Table 1 provides clarity on the size of measurement tools used the recipes. The cooking tools needed to prepare them include a mortar and pestle, sieve, pots, buckets (for washing cooking tools and utensils with soap and water), cups, spoons and bowls. These may all be found among households in rural areas.

<b>Measure</b>	<b>Quantity of water</b>
Cup	400 ml
Tablespoon	15 ml
Teaspoon	5 ml

Table 1. Measurements.

## Fish-based soup and porridges

Three recipes were developed to meet the nutritional needs of children aged 6–23 months. They are based on local foods and child feeding practices in Zambia. By including small dried fish as an ingredient, the recipes aim to promote the consumption of foods rich in protein, vitamins and minerals, which children should consume in addition to breast milk. The quantity and frequency of feeding should follow international and national child feeding recommendations. As such, this booklet should be used alongside the Improved Complementary Foods Recipe Booklet developed by the National Food and Nutrition Commission. Table 2 provides an overview of national child feeding recommendations. An additional rule of thumb is to prepare 30 g of the dry mix porridge for one meal for children 6–11 months old and then double this amount for children 12–23 months old. The following porridge dry mix fish-based porridge or soup recipes may also be prepared for and consumed by pregnant and lactating women.

Age in months	Texture	Meal frequency	Amount of flour per meal	Amount of food an average child will eat at each meal
6–8	<ul style="list-style-type: none"> <li>Start with thick porridge, well-mashed foods</li> <li>Continue with mashed family foods</li> </ul>	2–3 meals per day plus frequent breastfeeding	Start with 2–3 heaped tablespoons and gradually increase to ½–¾ cup	½–¾ cup
9–11	Finely chopped or mashed foods and foods that infants can pick up	<ul style="list-style-type: none"> <li>3–4 meals plus breastfeeding</li> <li>Depending on the child's appetite, 1–2 snacks may be offered between meals</li> </ul>	3–4 heaped tablespoons	¾–1 cup
12–24	Family foods, chopped or mashed, if necessary	<ul style="list-style-type: none"> <li>3–4 meals plus breastfeeding</li> <li>Depending on the child's appetite, 1–2 snacks may be offered between meals</li> </ul>	5–6 heaped tablespoons	1–1¼ cups (thicker consistency)
1 cup = 200 ml* 1 tablespoon of flour = 10 g 3 tablespoons of flour = ½ cup * The cup size used in the Improved Complementary Foods Recipe Booklet developed by the National Food and Nutrition Commission is 200 ml.				

Table 2. Amounts of foods to offer (PAHO and WHO 2003; NFNC 2007).

## Fish-Bean-Vegetable Soup

### Ingredients

- 3 tablespoons dried small fish powder
- 2 tablespoons maize meal
- 2 tablespoons soya bean flour
- 3 tablespoons bean powder
- 3 tablespoons dried green leafy vegetable powder
- 3 tablespoons dried mushroom powder
- 2 tablespoons onion powder
- 1 tablespoon garlic powder
- 2 teaspoons salt
- 3 tablespoons vegetable oil

### Preparation

1. In a small bowl, thoroughly mix the dried fish powder, dried green leafy vegetable powder, dried mushroom powder, onion and garlic powder, soya bean flour and bean powder together.
2. Pour 2 cups of water into a pot.
3. Add the mix to the pot while stirring continuously. Bring the mixture to a boil.
4. Add water so that the mixture becomes smooth and slightly thick. (More or less water may be added so that the soup takes on the preferred consistency).
5. Continue to stir occasionally to avoid lumping.
6. Cook for 15–20 minutes. Stir continuously so the soup does not stick to the bottom of the pot.
7. Serve in a clean bowl.

**Cost:** ZMW 7.00

### Recommended usage

- For children aged 6–23 months, the soup can be prepared as one meal.
- For pregnant and lactating women, as well as others in the household, it can be consumed before a main meal.

Estimated servings	Weight of serving size (dry mix) g	Tablespoons per serving (dry mix)	Target group
5.5	30	4.5	Children 6–11 months
3	60	9	Children 12–23 months
1.5	100	15	Pregnant and lactating women; adults and youth

Table 3. Servings for fish-bean-vegetable soup recipe.



## Fish-Sorghum Porridge

### Ingredients

- ¼ cup dried small fish powder
- 1 cup sorghum meal
- ¼ cup pounded groundnut
- ½ cup sweet potato flour
- Sugar to taste

### Preparation

1. In a bowl, mix the sorghum meal, pounded groundnut, sweet potato flour and dried fish powder.
2. Mix 2 cups of water with the porridge mix and make a smooth paste.
3. Boil 6 cups of water in a pot.
4. Add the paste to the boiling water and mix until smooth.
5. Cook for 15 minutes and add sugar to taste.
6. Serve in a clean bowl.

**Cost:** ZMW 6.50

### Recommended usage

- For children aged 6–23 months, the porridge can be prepared as a meal.
- For pregnant and lactating women, as well as other members of the household, it can be consumed for breakfast or as a snack between meals.

Estimated servings	Weight of serving size (dry mix) g	Tablespoons per serving (dry mix)	Target group
16	30	3.5	Children 6–11 months
8	60	6.5	Children 12–23 months
5	100	11	Pregnant and lactating women; adults and youth

Table 4. Servings for fish-sorghum porridge recipe.



## Fish-Millet Porridge

### Ingredients

- 2 tablespoons dried small fish (e.g. *kapenta*, *chisense*, *dagaa*) powder
- 3 tablespoons soya bean meal
- 1 tablespoon dried leafy green vegetable powder (cassava leaves)
- ½ cup ground millet
- ½ teaspoon salt
- Sugar to taste

### Preparation

1. In a bowl, mix the soya bean meal, cassava leaf powder, dried fish powder, ground millet and salt.
2. Mix 1 cup of water with 1 cup of porridge mix and make a smooth paste.
3. Boil 3 cups of water in a pot.
4. Add paste to the boiling water and mix until smooth.
5. Cook for 15 minutes and add sugar to taste.
6. Serve in a clean bowl.

**Cost:** ZMW 5.50

### Recommended usage

- Serve the porridge for breakfast or as snack in between meals.

Estimated servings	Weight of serving size (dry mix) g	Tablespoons per serving (dry mix)	Target group
4.5	30	4.5	Children 6–11 months
2.5	60	8.5	Children 12–23 months
1.5	100	1 cup (entire mix)	Pregnant and lactating women; adults and youth

Table 5. Servings for fish-millet porridge recipe.





# Fish-based spice and chutney

The following two recipes can be prepared to enhance the quality of the diets of pregnant and lactating women, who have additional nutrient requirements during these life stages. A tablespoon of the fish powder spice can be added to relishes, vegetables, soups or snacks and the fish chutney can be consumed as a relish or added to vegetables. Both recipes may also be prepared for the household as a whole.

## Fish Powder Spice

### Ingredients

- 2 tablespoons roasted dried small fish powder
- 4 teaspoons salt
- 1 teaspoon turmeric powder
- ½ teaspoon chili powder

### Preparation

1. In a small bowl, thoroughly mix the dried fish powder, salt, turmeric powder and chili powder.

**Cost:** ZMW 3.00

### Recommended usage

- The fish powder spice can be added to vegetable soups and other dishes, or snacks like roasted groundnuts, fritters, roasted cassava or roasted maize to add flavor and nutritional value.

Estimated servings	Tablespoons per serving	Target group
4	1	Pregnant and lactating women; adults and youth

Table 6. Servings for fish powder spice recipe.



## Fish Chutney

### Ingredients

- 10 tablespoons dried small fish
- 4 tablespoons pounded raw groundnuts
- 10 tablespoons chopped onion
- 1 teaspoon chili powder
- 2 teaspoons salt
- 4 teaspoons vegetable oil

### Preparation

1. Wash the dried small fish.
2. Remove the fish from the water, roast for 30 minutes over low heat and then coarsely pound.
3. In a pan, heat oil then add coarsely pounded fish and fry over medium heat for 15 minutes.
4. Add onions and continue frying for another 10 minutes.
5. Add pounded groundnuts and cook for 15 minutes or until mixture stops sticking.
6. Add salt and chili powder and then fry for 5 minutes.
7. Remove from heat and leave to cool.
8. Store in an airtight container.

**Cost:** ZMW 8.50

### Recommended usage

- Use as an ingredient in relishes to be eaten with nshima or rice.
- Add desired amount to vegetables while cooking.
- Add chopped tomatoes and a bit of water to fish chutney, simmer for 5–10 minutes.
- May be added to vegetables or served as a relish.

Estimated servings	Tablespoons per serving	Target group
12	2 heaped tablespoons	Pregnant and lactating women; adults and youth

Table 7. Servings for fish chutney recipe.



# References

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Bogard JR, Hother AL, Saha M, Bose S, Kabir H, Marks GC and Thilsted SH. 2015. Inclusion of small indigenous fish improves nutritional quality during the first 1000 days. *Food and Nutrition Bulletin* 36(3):276–89.

Dewey KG and Brown KH. 2003. Update on technical issues concerning complementary feeding of young children in developing countries and implications for intervention programs. *Food and Nutrition Bulletin* 24:5–28.

[IOM] Institute of Medicine of the National Academies. 2017. Dietary Reference Intakes. Washington, DC: National Academies Press.

Longley C, Thilsted SH, Beveridge M, Cole S, Nyirenda DB, Heck S and Hother AL. 2014. The role of fish in the first 1000 days in Zambia. *IDS Bulletin* (September):27–37.

[NFNC] National Food and Nutrition Commission of Zambia. 2007. Improved complementary foods recipe booklet. Lusaka: NFNC.

[PAHO] Pan American Health Organization and [WHO] World Health Organization. 2003. Guiding principles for complementary feeding of the breastfed child. Geneva: PAHO & WHO.

[WHO] World Health Organization. 2003. Global strategy for infant and young child feeding. Geneva: WHO.

## Appendix: Nutrient composition of fish-based recipes

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Nutrient analyses were carried out on the five fish-based recipes. The fish species included in the samples were *kapenta*, *chisense* and *dagaa*. This is important to note as the nutritional content of the recipe will differ depending on the species included. One 100 g sample of each recipe was prepared and sent for testing at the Microchem Specialized Lab Services in Cape Town, South Africa. Dry samples of the fish soup, porridges and spice powder were sent to the laboratory, while a prepared sample of the fish chutney was sent. Because of the resources available at the lab, only the nutrients listed in the tables below were assessed. There is therefore an opportunity to complete additional analyses of these recipes for other vitamins and minerals in the future.

		6–11 months			12–23 months				
Nutrient	Unit of measure	Daily recommended level			30 g of dry mix	Daily recommended level			60 g of dry mix
Energy	kcal	217–601			400.20	516–1,028			800.40
		EAR	RDA	AI		EAR	RDA	AI	
Fat	g			30	1.85				3.69
Fatty acids									
Omega-3	g				0.22				0.43
ALA	g			0.5	0.18			0.7	0.36
EPA	g				0.01				0.02
DHA	g				0.00				0.00
DPA	g				0.03				0.05
Omega-6	g				0.66				1.32
Minerals									
Calcium	mg			260	208.80	500	700		417.60
Iron	mg	6.9	11		2.39	3	4.78		4.78
Zinc	mg	2.5	3		1.31	2.5	3		2.61
Sodium	g			0.37	0.25			1.0	0.49
Protein	g		11		8.94		11		17.88
Carbohydrates	g			95	7.56	100	130		15.12
Fiber	g				6.45			19	12.90

Table 8. Nutrient content of fish-bean-vegetable soup and daily recommended levels of dietary intake for infants (Bogard et al. 2015; Dewey et al. 2003; IOM 2017).



		Pregnant women						Lactating women						100 g of dry mix
Nutrient	Unit of measure	Recommended level 14–18 years old			Recommended level 15–50 years old			Recommended level 14–18 years old			Recommended level 15–50 years old			
Energy	kcal													1,334
		EAR	RDA	AI	EAR	RDA	AI	EAR	RDA	AI	EAR	RDA	AI	
Fat (total)	g													6.15
Fatty acids														
Omega-3	g													0.72
ALA	g			1.4			1.4			1.3			1.3	0.61
EPA	g													0.03
DHA	g													0.00
DPA	g													0.09
Omega-6	g													2.20
Minerals														
Calcium	mg	1,000	1,300		800	1,000		1,000	1,300		800	1,000		696.00
Iron	mg	23	27		22	27		7	10		6.5	9		7.97
Zinc	mg	10.5	12		9.5	11		10.9	13		10.4	12		4.35
Sodium	g			1.5			1.5			1.5			1.5	0.82
Protein	g		71			71			71			71		29.80
Carbohydrates	g	135	175		135	175		160	210		160	210		25.20
Fiber	g			28			28			29			29	21.50

*\*Energy requirements vary by body mass index and physical activity level.*

Table 9. Nutrient content of fish-bean-vegetable soup and daily recommended levels of dietary intake for pregnant and lactating women (IOM 2017).

		6–11 months				12–23 months			
Nutrient	Unit of measure	Daily recommended level			30 g of dry mix	Daily recommended level			60 g of dry mix
Energy	kcal	217–601			452.40	516–1,028			904.80
		EAR	RDA	AI		EAR	RDA	AI	
Fat	g			30	1.39				2.78
Fatty acids									
Omega-3	g				0.11				0.21
ALA	g			0.5	0.07			0.7	0.15
EPA	g				0.01				0.02
DHA	g				0.02				0.03
DPA	g				0.01				0.01
Omega-6	g				0.51				1.02
Minerals									
Calcium	mg			260	150.30	500	700		300.60
Iron	mg	6.9	11		1.10	3	4.78		2.21
Zinc	mg	2.5	3		0.80	2.5	3		1.60
Sodium	g			0.37	0.05			1.0	0.09
Protein	g		11		4.95		11		9.90
Carbohydrates	g			95	17.61	100	130		35.22
Fiber	g				2.19			19	4.38

Table 10. Nutrient content of fish-sorghum porridge and daily recommended levels of dietary intake for infants (Bogard et al. 2015; Dewey et al. 2003; IOM 2017).

		Pregnant women						Lactating women						100 g of dry mix
Nutrient	Unit of measure	Recommended level 14–18 years old			Recommended level 15–50 years old			Recommended level 14–18 years old			Recommended level 15–50 years old			
		EAR	RDA	AI	EAR	RDA	AI	EAR	RDA	AI	EAR	RDA	AI	
Energy*	kcal													1,508
Fat	g													4.64
Fatty acids														
Omega-3	g													0.35
ALA	g			1.4			1.4			1.3			1.3	0.25
EPA	g													0.03
DHA	g													0.05
DPA	g													0.02
Omega-6	g													1.70
Minerals														
Calcium	mg	1,000	1,300		800	1,000		1,000	1,300		800	1,000		501.00
Iron	mg	23	27		22	27		7	10		6.5	9		3.68
Zinc	mg	10.5	12		9.5	11		10.9	13		10.4	12		2.66
Sodium	g			1.5			1.5			1.5			1.5	0.16
Protein	g		71			71			71			71		16.50
Carbohydrates	g	135	175		135	175		160	210		160	210		58.70
Fiber	g			28			28			29			29	7.30

\*Energy requirements vary by body mass index and physical activity level.

Table 11. Nutrient content of fish-sorghum porridge and daily recommended levels of dietary intake for pregnant and lactating women (IOM 2017).

		6–11 months				12–23 months			
Nutrient	Unit of measure	Daily recommended level			30 g of dry mix	Daily recommended level			60 g of dry mix
Energy	kcal	217–601			594	516–1,028			1,188
		EAR	RDA	AI		EAR	RDA	AI	
Fat	g			30	10.20				20.39
Fatty acids									
Omega-3	g				0.59				1.19
ALA	g			0.5	0.38			0.7	0.75
EPA	g				0.05				0.09
DHA	g				0.14				0.29
DPA	g				0.02				0.04
Omega-6	g				4.32				8.64
Minerals									
Calcium	mg			260	206.40	500	700		412.80
Iron	mg	6.9	11		3.63	3	4.78		7.26
Zinc	mg	2.5	3		1.29	2.5	3		2.58
Sodium	g			0.37	0.10			1.0	0.20
Protein	g		11		5.73		11		11.46
Carbohydrates	g			95	5.19	100	130		10.38
Fiber	g				3.93			19	7.86

Table 12. Nutrient content of fish-millet porridge and daily recommended levels of dietary intake for infants (Bogard et al. 2015; Dewey et al. 2003; IOM 2017).

		Pregnant women						Lactating women						100 g of dry mix
Nutrient	Unit of measure	Recommended level 14–18 years old			Recommended level 15–50 years old			Recommended level 14–18 years old			Recommended level 15–50 years old			
Energy*	kcal													1,980
		EAR	RDA	AI	EAR	RDA	AI	EAR	RDA	AI	EAR	RDA	AI	
Fat	g													33.99
Fatty acids														
Omega-3	g													1.98
ALA	g			1.4			1.4			1.3			1.3	1.26
EPA	g													0.16
DHA	g													0.48
DPA	g													0.07
Omega-6	g													14.40
Minerals														
Calcium	mg	1,000	1,300		800	1,000		1,000	1,300		800	1,000		688
Iron	mg	23	27		22	27		7	10		6.5	9		12.10
Zinc	mg	10.5	12		9.5	11		10.9	13		10.4	12		4.30
Sodium	g			1.5			1.5			1.5			1.5	0.20
Protein	g		71			71			71			71		19.10
Carbohydrates	g	135	175		135	175		160	210		160	210		17.30
Fiber	g			28			28			29			29	13.10

\*Energy requirements vary by body mass index and physical activity level.

Table 13. Nutrient content of fish-millet porridge and daily recommended levels of dietary intake for pregnant and lactating women (IOM 2017).

<b>Nutrient</b>	<b>Unit of measure</b>	<b>9.2 g or 1 heaped tbsp</b>
Energy	kcal	76.82
Fat	g	0.46
Fatty acids		
Omega-3	g	0.11
ALA	g	0.01
EPA	g	0.00
DHA	g	0.07
DPA	g	0.03
Omega-6	g	0.05
Minerals		
Calcium	mg	215.46
Iron	mg	1.00
Zinc	mg	0.88
Sodium	g	0.98
Protein	g	3.29
Carbohydrates	g	0.04
Fiber	g	0.39

Table 14. Nutrient content of fish powder spice for pregnant and lactating women.

<b>Nutrient</b>	<b>Unit of measure</b>	<b>30 g or 2 heaped tbsp</b>
Energy	kcal	417.60
Fat	g	1.93
Fatty acids		
Omega-3	g	0.21
ALA	g	0.21
EPA	g	0.00
DHA	g	0.00
DPA	g	0.00
Omega-6	g	0.51
Minerals		
Calcium	mg	510.30
Iron	mg	1.91
Zinc	mg	2.20
Sodium	g	0.31
Protein	g	10.80
Carbohydrates	g	7.95
Fiber	g	3.48

Table 15. Nutrient content of fish chutney for pregnant and lactating women.

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