International Research Symposium
Rajarata University of Sri Lanka

IRSyRUSI 2015

A Study of Food Consumption Pattern, Food Culture and Nutritional Status of the Multi-day Fishermen of Sri Lanka

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ABSTRACT

Fishers engage in multi-day fishing are away from land for nearly one month. The literature does not provide sufficient information to understand their food habits and nutritional level. This research was focused to study the food consumption pattern, food culture, calorie intake and calorie expenditure and its influence on Body Mass Index (BMI) of multi-day fishers. A pre-tested structured questionnaire was implemented to collect data from fishery harbors of Negambo, Mirissa and Beruwala. Ninety skippers (30 from each harbor) were randomly selected from ninety multi-day boats. The in-depth interviews carried out with six selected skippers from each harbor. The fishers spent average 22±13 days in the sea and they carried foods sufficient enough for 31±19 days. The average cost of food expenditure was SLR. 89,278.00 per fishing trip. It was one third of the total variable cost. The fishermen consumed balance diet up to two weeks and after that their diets were limited to the foods only rich with starch and protein. The daily fish consumption of fishermen was 0.676 kg. The composition of average diet of a fisherman was 37% of protein, 49% of carbohydrate, 3% of dairy products and 11% of fruit and vegetable. Actual daily energy intake of one fisherman was 3535 Kcal. It was significantly higher than recommended daily energy intake value (t=2.233). Sixteen percent fishers were found to be obese and there were 47% overweight subjects. Though the fishermen consumed of food than their energy requirement throughout the fishing trip, their accessibility to balance diet was limited in latter part of the journey hence they suffered from the double burden of overweight and malnutrition together.

KEYWORDS: *Balance diet, Consumption pattern, Energy intake, Multi-day fishing boat, Total energy expenditure*

1 Introduction

Sri Lankan fishery industry can be divided in to three categorise as marine capture fishing, inland capture fishing and aquaculture. The coastal fishing and deep sea fishing are the two division of marine fishing. Generally, deep sea areas including continental shelf and exclusive economic zone are used for multiday fishing activities (Herath, 2011). The fishers who spend more than one day to complete one fishing journey are called as multi-day fishermen. There is a clear difference in task performed between boat owner and crew members in the multi-day fishing. Most probably boat owners do not participate for fishing activities directly. They invest money to organize a fishing trip and once boat landed with fish harvest, selling process is done by the boat owners. The owner recruits fishermen as the crew members for their boats. In Sri Lanka about 4,447-multi-day boats were operated and at least 25,000 fishermen have engaged with multi-day fishing. During 2014, multi-day fishermen harvested 180,450 metric tons of fish and they contributed 33.7% of annual fish production in Sri Lanka (Ministry of fisheries and aquatic resource development, 2015).

2 Statement of the Problem

The labor productivity depends on health of the laborer. The foods consumed by the labor force are very important factor to maintain a good health. Hence food consumption behavior and nutritional assessment of labor force is inevitable. Multiday fishers are the back born of Sri Lankan fishing industry hence studying about their food consumption behavior is very important. Several studies have been done to understand food consumption pattern of fishing households but very few researchers discussed about food consumption pattern and nutritional status of deep sea fishing labour force. Multi-day fishermen spend nearly 175 full days in the sea and they take over three meals per day as well they spend considerable amount of the variable cost of fishing trip (Herath, 2011). The environment factors of the sea are completely different from land; the boat has very limited space for cooking and storing foods. As well there are no any food outlets in the sea to buy foods. Under all these circumstance, about foods varieties consume by fishermen in the sea, different practices they follow to preserve and prepare foods, their food culture and their body mass index (BMI) level are some of the valuable information to predict about the food consumption behavior and nutritional status of multiday fishers. This research was taken an attempt to provide that information.

3 Objectives of the Study

This research try to understand food types, socioeconomic perspective related to food consumption behavior and nutritional status of multi-day fishermen during the fishing journey. The specific objectives of the research are to identify food types, and compare food composition of fishermen's diet and balance diet, to study the food consumption patterns and food related socioeconomic perspectives, to compare energy intake and total energy expenditure of multi-day fishermen during fishing trip and to measure the BMI of Multi- day fishermen and observe the relationship of BMI and energy intake of Multi-day fishermen.

4 Review of Literature

4.1 Importance of balance diet

Eating well is essential and vital for a healthy and active life. It has been noted that calorie intake have a strong linkage with both human health and productivity. The human body needs dietary energy to maintain normal body metabolic functions and engage in activities related to good health and hygiene. In addition, calorie intake is the main determinant of under nutrition and malnutrition among the people. It is needed for growth and assimilation of micronutrients. Inadequate supply of calorie lowers productivity, hinders learning and increases the risk of diseases (Aromolaran, 2004). As well over calorie intake also create problems on human health. Aromolaran (2004) further argued that the level of calorie intake (both stock and flow) by an individual should be adequate to sustain his functions and activities over his expected lifetime. When this lifetime calorie consumption pattern falls short of a minimum threshold, the individual is at a health risk. Secondly whenever there is a persistent short fall in the flow of calorie intake relative to the amount required for optimal productive activity, the inflow of other nutrient intakes is likely to be affected since the resources required to acquire these nutrients is obtained from productive work.

Achieving and sustaining appropriate body weight across the lifespan is vital to maintaining good health and quality of life. Many behavioral, environmental, and genetic factors have been shown to affect a person's body weight. Calorie balance over time is the key to weight management. Calorie balance refers to the relationship between calories consumed from foods and beverages and calories expended in normal body functions (i.e., metabolic processes) and through physical activity. People cannot control the calories expended in metabolic processes, but they can control what they eat and drink, as well as how many calories they use in physical activity. Calories consumed must equal calories expended for a person to maintain the same body weight. Consuming more calories than expended will result in weight gain. Conversely, consuming fewer calories than expended will result in weight loss. This can be achieved over time by eating fewer calories, being more physically active or best of all, a combination of the two. Maintaining a healthy body weight and preventing excess weight gain throughout the lifespan are highly preferable to losing weight after weight gain. Once a person becomes obese, reducing body weight back to a healthy range requires significant effort over a span of time, even years (USDA, 2010).

4.2 The Body Mass Index (BMI)

BMI is the famous indicator to decide over weight or underweight. The BMI is an attempt to quantify the amount of tissue mass (muscle, fat, and bone) in an individual (James, 2008). The BMI is calculated as the body mass divided by the square of the body height, and is universally expressed in units of kg/m^2, resulting from mass in kilograms and height in meters. The BMI may also be determined using a table or chart which displays BMI as a function of mass and height using contour lines or colours for different BMI categories, and may use two different units of measurement (Keys, 1972). Commonly accepted BMI ranges are underweight: under 18.5, kg/m^2 normal weight: 18.5 kg/m^2 to 25 kg/m^2, overweight: 25 kg/m^2 to 30 kg/m^2, obese: over 30 kg/m^2.

Table1. BMI Classification

Category	BMI range (kg/m^2)
Very severely underweight	less than 15
Severely underweight	from 15.0 to 16.0
Underweight	from 16.0 to 18.5
Normal (healthy weight)	from 18.5 to 25
Overweight	from 25 to 30
Obese Class I (Moderately obese)	from 30 to 35
Obese Class II (Severely obese)	from 35 to 40
Obese Class III (Very severely obese)	over 40

(Source: WHO, 2006)

Today, overweight and obesity have become major global public health problems. Worldwide, the proportion of adults BMI of 25 kg/m^2 or greater increased from 28.8% to 36.9% in men, and from 29.8% to 38.0% in women between 1980 and 2013 (Fleming, 2014). Therefore, urgent actions from governments and the food industries are needed to curb the epidemic (Gortmaker, 2011).

4.3 Calorie intake and expenditure

To keep proper BMI should be maintain balance between calorie consumed and calorie expended. The Total energy expenditure (TEE) defines as the energy spent, on average, in a 24-hour period by an individual. (FAO, 2001). Calculation of the TEE consists with two steps. First step is calculating Basal metabolic rate (BMR) and second step is converting BMR in to TEE. Basal metabolic rate (BMR) is the measurement of an organism's energy expenditure when at rest (White 2012) and it is estimated by Harris–Benedict equation (Roza, 1984).

To calculate TEE, BMR should be multiplied from converting factor. This converting factor vary with the

physical activity perform by the person as habit and their life style (FAO, 2001). The same information given by FAO, is much more elaborate by MCArdel (2006) and he presented a table with activity factor values according to the job (Table2).

Table 2. Activity factor classification

Activity category	Activity factor	Description
Very light	< 1.3	About 10 hours rest, about 14 hours of very light activity
Light	1.51-1.625	Sedentary job minimal leisure time activity
Light- moderate	1.626- 1.75	Sedentary job, about 2-3 hours regular leisure time activity per week
Moderate	1.76 – 2	Sedentary job, > about 3 hours regular leisure time activity per week
Strenuous	2.01 -2.3	Light-moderately manual labour at least 8 hours
Very Strenuous	>2.31	Heavy labour at least 8 hours

(Source: MCArdel,2006)

4.4 Recommendation for balance diet

To keep proper BMI should be maintain balance between calorie consumed and calorie expended. The Total energy expenditure (TEE) defines as the energy spent, on average, in a 24-hour period by an individual. (FAO, 2001). Calculation of the TEE consists with two steps. First step is calculating Basal metabolic rate (BMR) and second step is converting BMR in to TEE. Basal metabolic rate (BMR) is the measurement of an organism's energy expenditure when at rest (White 2012) and it is estimated by Harris–Benedict equation (Roza, 1984).

Consuming alone foods with recommended level of calorie does not help to maintain healthy life and we should concern to intake balance diet with all the nutrients important to body in accurate ratios. The Dietary Guidelines Report of the U.S.D.A (2010) introduced guidelines for healthy diet in a practical way called as MyPlate. It is divided into sections of approximately 25% of carbohydrate base products, 35% of vegetables, 10 % of fruits and 20 % of protein and 10% of dairy products are accompanied by a smaller circle representing dairy, such as a glass of milk or a yogurt cup. So this includes five food groups to guide selection of healthful varieties of foods such as fruits, vegetable, grains, protein and dairy foods. Choosing foods from each of the food groups and a variety of foods from within the same food group ensures consumer getting the nutrients they need for maintaining good health. Different food groups provide different nutrients that human bodies need. (USDA, 2011) Food and Nutrition Board of America (2004) recommended, a mature male should be intake at least 3.7L of liquid per day.

Calculate. For that calorie value of 1Kg of each food item was found through USDA (2002) data base.

4.5 Introduction about multiday boat and its layout

Multiday boats were introduced in to Sri Lanka in the period of late 1970's and early 1980's. The multiday vessels were constructed in fiber glass material and average length was about 14 m (Herath, 2011). The average beam length of these vessels was 6 m. The Average unladed draught of the vessel was 2.1 meters and it has a displacement of 11 tons. The average volume of the fuel tank was 500L which were installed in the engine room and it might be enough for fishing trips lasting around 2 weeks. The large boats were carried additional containers which could be stored fuel up to 2500 L – 5000 L and It was enough two months journey. The fresh water capacity in the two tanks provided under the deck was of 450 L. in addition, a large water container was secured on the deck with 1000 L of water. A water tap through a foot pump was also provided at a sink. The vessel had a 7.5 m^3 capacity insulated fish hold which was divided in to six compartments. In addition to cool chamber, there were two storage spaces at front and rear of the boat (Department of fisheries, 1995).

5 Methodology

Negombo, Beruwala, and Matara (Mirissa) fishery harbours were selected for the study since these three districts reported the highest availability of multiday boats which represented 50% from whole country. A pretested structured questionnaire was implemented in three fishery harbors to elicit the relevant information and data. A list of already landed boats in the harbor was prepared as first step of the sample selection. This list was categorized in to the strata according to the size of boats as large, medium and small. Then, samples were randomly selected to represent the all strata's. The skippers of 90 selected multi day boats (30 from each harbor) were interviewed from November 2014 to April 2015. The data related to last boat trip such as quantity of each and every food item, quantity of wasted, quantity of shared with other boats remaining, quantities of remained foods, number of crew members participated , number of days spent in the sea, were recorded in the questionnaire. Six selected skippers from each harbor were interviewed in depth to have more clear view on their food culture and habit.

The Harris–Benedict equation (Equation 1) revised by Roza and Shizgal (1984) was used to calculate the daily energy requirement of the respondent

$$\text{Basal metabolic rate} = 88.362 + (13.397 \times \text{weight in kg}) + (4.799 \times \text{height in cm}) - (5.677 \times \text{age in years}) \quad (1)$$

Three different levels of TEE were recorded in active fishing days, fishing ground searching days and non-fishing days. The equation 2 presents the average TEE of the fisherman for whole fishing trip.

$$\text{TEE} = \frac{[2.31 * \text{active fishing days} * \text{BMI}] * [1.76 * \text{fishing ground searching days} * \text{BMI}] * [2.31 * \text{Non fishing days} * \text{BMI}]}{\text{Number of fishing days}} \quad (2)$$

The daily energy intake was calculated in three steps in which consumed food quantity, energy gain through each food type and daily energy intake were calculated (Equation 3,4 and 5)

$$\text{Consumed food (QX)} = [\text{Q1carried} + \text{Q2 received}] - [\text{Q3 reamined} + \text{Q4 donated} + \text{Q5wasted}] \quad (3)$$

$$\text{Calorie amount (CX)} = \text{QX} * \text{Calories of 1Kg of QX food type} \quad (4)$$

To calculate daily energy intake, summation of calories gain through all the food items divided from number of real days spent for the fishing trip.

$$\text{Daily energy intake} = \frac{\sum_{i=0}^{n} C1}{\text{numberof days per fishing trip}} \quad (5)$$

The collected data were subjected to various parametric and non-parametric statistical analyses using SPSS ver. 20 statistical package.

6 Results and Discussion

6.1 General information about the multiday fishermen and their food storage facilities in the boat

On Average 5+2 crew members participated for fishing. Average age of the fishermen was 36 ±17 years. Number of crew members per boat was significantly correlated with the size of the boat ($r = 0.80$, $P = 0.01$). On average fishermen expected to spend 31+ 19 days in the sea and they carried bulk of food, water and other stuffs which were sufficient enough for the period. However, some fishermen completed their fishing within 21+12 days. In this scenario fishers had excess food for additional ten days.

All the dry foods were stored inside the cabin and perishable food items were stored in cool room. Same space was utilized to store ice blocks and caught fish. Coconuts were kept in a wooden cell located beneath deck of the boat and water tank was located back of the boat. Accommodation for 5 persons on bulks was provided on the port side and basic cooking facilities were incorporated in the wheel house which was located aft of the vessel. There were rack and pantries to stock dry foods. Latter part of the cabin of 2.78 m^2 area was compartmented for kitchen where the sink, the gas cooker and the gas tank were placed. The boat had very limited space and 75% of the space was covered from the foods, fishing gears and other stuffs. Hence fishermen had a tiny area for their movements.

6.2 Food varieties and balance diet

Main carbohydrate food source of the fishermen was rice and they had consumed 60 kg of rice during 21 days fishing journey. Mung-bean, cowpea, finger millet, chick pea and gingerly were used as serial foods. Sweet potato, manioc and other yams were also consisted in carbohydrate base food basket but the shelf lives of yams were limited in to three days. In addition, bread, noodles, biscuits, cereal flour mixtures (Eg:- Samaposha) and the food prepared from wheat flour were used as carbohydrate food sources. However, bread, cake, wheat and rice flour were unable to store for long time in the boat due to high humidity conditions of the sea atmosphere. The fishermen were willing to bring biscuits and instant noodles in small packs because of the long shelf life and instantly ready to consume. Further toffee, chocolate and dates were contained in fishermen's food basket and sweets and sugar consumption was 87g per person per day. Altogether individual fishermen consumed 638g carbohydrate base food per day. On average 18 varieties of vegetables were carried in small quantities (150g -200g from each variety). The fishermen highly concerned to select the vegetables with long shelf life such as beet, radish, cabbage and hard squash. To minimize the monotonous feeling create in the sea environment fishermen consumed many varieties of foods in the sea. Moreover, unfavorable weather condition accelerated deterioration of the vegetables and they were willing to bring small quantities from each variety. Therefore, they only had opportunity to consume vegetable for maximum 10 days. The coconut had higher demand from fishermen (and nearly 92 coconuts were consumed within one month). However, the fishermen brought150 coconuts to make sure they had enough. With their experiences, about 62% of the coconuts perished due to contact with sea water and existence of extreme heat. Coconut oil and vegetable oil were essential to prepare foods in the multiday boats and in average 5.5L of coconut oil and 3L of vegetable oil were carried. The fishermen added more than one fried since it was easier to prepare. The main cooking energy source in a boat was gas and they used one gas tank on average for 21 days.

The fishermen consumed 178g of vegetables per day. Within one fishing trip, the fishermen consumed at least 5 varieties of fruits. Due to long shelf life, apple and grapes were very famous among fishermen and approximately 6.4kg of apple and 2.5kg of grapes were stored in the fish storing chamber with ice. To minimize the dehydration problem, in the sunny days they consumed watermelon and oranges. Papaya and banana were brought by 65% of the boats but they had to finish those with in fist four days because of high perishability. The fruit consumption of fishermen was very poor while fishing and it was recorded as 85 g per person per day.

Fish, egg and meat were the major animal protein sources and soy bean, dhal were the major plant protein source used by fishermen. The beef and pork were popular among Negambo fishermen, but Beruwalla and Mirissa fishers were solely depend on chicken. The religion differences significantly influenced the meat consumption. ($p= 0.02$) There were higher demand for pork by majority of Christian and Catholic fishers of Negambo compare to Buddhist fishermen from Beruwala and Mirissa. All the fishers were used meat as a substitute for fish and they carried meat only for first four days. At the end of the first weak they entered in to the fishing ground and started fish catching. The fishers used to bring average 3kg of dried fish and 2kg of canned fish as a substitute for meat in first week. Once they had fish harvest, fish became a compulsory food item of all three meals in a day. Fishermen consumed 0.900kg fish per head per day. And it was an extremely higher value than average fish consumption of the country. Eggs were not much popular protein source among fishermen due to higher fragility. Especially fishers of Negambo consumed eggs in row form or mixed with coffee than cooking.

The crew members who fishing under fewer facilities used water of the container for both washing and drinking. However, fishes in large boats with many facilities were brought bottle water for both drinking and cooking purposes. On average they brought 175 water bottles (1.5 L of each) for a journey. Fishermen drank 1.75L of pure water per day. Carbonated drinks were very popular among fishermen and they carried 30 number of 1.5L carbonated drink bottles per a trip. The gap between expected days and actual days of a trip positively correlated with individual daily water consumption ($r = 0.57$, $P = 0.01$). Aggregate drinking volume of non-water liquid (carbonated drinks, tea, coffee, dairy products) were 780ml (for that the volume of carbonate drinks, tea, coffee, dairy products were included). Altogether fishermen taken 2.53L of liquid per day but it is lower than the recommendations of Food and Nutrition Board of America (2004).

The food varieties differed with the season. In the off season ("Warakan") fishermen are not willing to bring variety of foods due to liability to damage under bad weather and it was difficult to cook in shaking craft with vicious tidal conditions. Hence they were prone to use well pack ready-made foods such as noodles, pasteurized milk packets and canned fish. During on-season they were willing to carry non-cook raw foods.

The pasteurized milk packets, milk powder, curd and yoghurt drinks were used as dairy products. However, none of the boats had recorded cheese, butter or other forms of dairy products. The Fishermen were willing to consume dairy products in liquid form than solid form. The fisherman consumed 110g + 23g of dairy product per day. The decayed percentage of dry foods and perishable foods were 11% and 19%, respectively, during the trip. The carried quantity of dry foods had shown strong positive correlation with number of fishing days ($r = 0.77$, $p=0.00$) and number of crewmembers ($r = 0.71$, $p=0.02$) but carried quantity of perishable food was correlated only with the number of crewmembers ($r=0.62$, $p=0.32$). Average food cost of one person per day had a positive significant correlation with size of the boat ($r=0.69$, $p=0.00$). But proportion of food cost from overall variable cost of a fishing tour had significant negative correlation with the size of the boat. ($r=0.67$, $p=0.00$).

As a stress management practice, the fishers were addicted to smoking and chewing betel. One boat carried nearly 700 cigarettes, 1080 "beedi" and 700 betel leaves per fishing trip and on average individual consumed seven cigarettes, ten "beedis" and 7 beetle leaves daily. As a norm fishers did not bring liquor for fishing journey but some fishers of southern province used to consume liquor while fishing but it did not revealed in this study. The My plate introduced by U.S.D.A (2011) recommended the composition of balance diet Table 3 shows comparison of Myplate food comparison and the average food composition of fishermen.

Table 3. The food composition comparison of Fishermen's plate with Myplate standard

Nutritional composition	MyPlate (%)	Fishermen's plate (%)	Difference (%)
Carbohydrate base foods	25	49	24
Vegetables	35	7	-28
Fruits	10	3	-7
Protein	20	37	17
Dairy products	10	3	-7

(Source: Compiled by the author based on survey data 2014/2015)

The food composition of fishermen's diet was deviated from balance diet and intake high amount of carbohydrate and protein than the balance diet. The vegetable, fruits and dietary foods proportions were considerably lower than the recommended percentages.

6.3 The comparison of food consumption patter and social behavior in four phases of the fishing trip

Through analyzing the qualitative information, four phases with different food consumption patterns can be identified in a fishing trip.

The fishermen were searching for fishing ground during the first phase of their fishing journey. Plenty of foods were available and a balance diet was taken by the fishermen in this phase. The quality, freshness and quantity of the foods were high. The fishermen highly consumed the foods with short shelf life such as vegetable, fruits, curds and egg. A main meal was consisted with more than five curries. Meats, dried fish and canned fish were consumed as a substitute for fish because fishermen were not start fishing yet. The consumption of dried and long shelf life foods was controlled for future use. Even though water availability was high, the fishermen carefully used water to save the latter part of the journey. The foods were donated for other boats which spent long time in the sea. The ice chambers had a sufficient space to store foods. All the fishers involved for cooking and they took meal together. The betel and cigarette consumption are comparatively low due to the lower stress and loneliness.

The second phase was prevailed over second week. This was the active fishing period hence fishers spent very short time to take their meal. The person who assigned for cooking quickly prepared the meal with one or two curries and the fisherman consumed foods individually. Availability of perishable fruits, vegetables and eggs were drastically reducing during this phase. Hence fish became the main animal protein source. Due to the closeness to the expiring dates yoghurt and liquid milk consumption were increased. To avoid the working stress they consumed lots of cigarette, "beedi" and betel. The liquid consumption was increased because fishermen were working on the open area of the deck during day time. The free space of cool chamber was reducing due to fish storing and the foods were contaminated from blood of the fish. The overall quality and freshness of perishable foods were deteriorating. If the fishermen were able to catch the expected quantity of fish within two weeks they had surplus foods to over-consume during return journey. The sleeping time duration of fishermen limited up to 4 hours.

Third phase was started after the second week and it was continued until commence of the return journey, that was the most harsh period because the fishermen had no clear idea about the return dates They had travelled hundreds of nautical miles to find the fishing grounds. After the most of the perishable foods were finished; dry foods and fish became the main components of the meal. Small quantity of beet, radish, apple, wood-apple, bael-fruit and few other long shelf life vegetables and fruits might be available. If the fishing journey extended up to 60 days the foods might be insufficient. The "coconut sambola", fried fish and rice were the main food items in this phase. Water consumption might be restricted due to the scarcity. They used sea water for washing purpose and pure water only for drinking and cooking purposes. Due to the scarcity of foods and cigarette, fishermen had to ask foods from other fishing vessels. If boat voyaged close to a harbor the boat might be landed and refilled the foods and water.

The final phase was return journey, and its duration might be one day to seven days. The duration of return journey was depended on the distance from final fishing ground to the harbor and the environmental conditions. When they started return journey fishermen had more time to rest and take meal, because they stop fishing and processing dry fish. As well the fishermen were over consuming foods, because they had no restriction to consume surplus water and foods. The fisher's lifestyle in return journey was somewhat lethargic and they slept 11 hours per day. The fishermen were willing to donate remaining foods for other boats.

The summary of the food composition changes in the four phase of fishing trip was given bellow. The total amount of each food item was taken as base value to calculate its percentage.

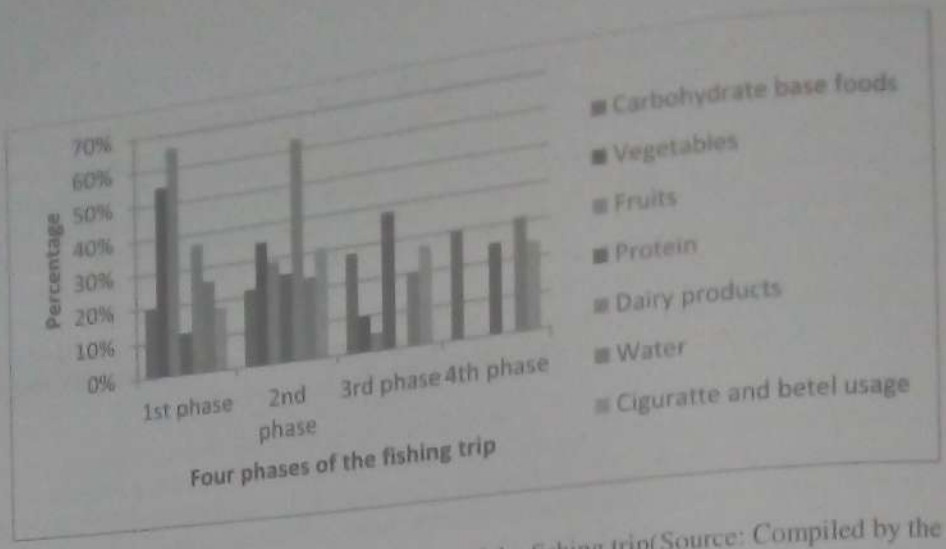

Figure 1: Food consumption variation of four phases of the fishing trip(Source: Compiled by the author based on survey data 2014/2015)

The average cost of food expenditure was SLR. 89278.00 per fishing trip. It was one third of the total variable cost. Only 57% of fishermen did not have the decision making power to select the foods and it was decided by the boat owner. Expected time duration of the fishing journey was also decided by the boat owner after negotiation with the crew members of the boat. After calculating the quantities of foods and water, the boat owner sent the order to whole sale shop and they delivered the goods to the harbour. Sometime the crew members were involved in shopping to assure the quality and quantity of foods. The crew members were responsible to pack the foods in the boat. Cigarette, betel and liquor were not provided by the boat owner and it was not included in variable cost of the boat.

To mitigate food scarcity, three alternative options could be taken. First option was purchasing foods from the land. This was not a common practice due to the high cost. Second option was requesting foods from other boat and that was the common practice. As an informal rule the majority of fishers were obligated to donate foods item which was requested by others and this option was crucial for assuring the food security in the sea. Third option was sent a message to the boat owner through radar and boat owner sent the food through another fishing boat which travelled towards the boat. This option was also not prominent because it was highly time consuming.

At the beginning of the journey the cooking duty assigned to a particular crew member and he was responsible for packing foods before the journey and he was accountable for managing the foods during the journey. Except the busy days other crew members were helped him to prepare the foods.

6.4 Energy intake and expenditure of the fishermen

The activity level of fishing trip was not equal throughout the fishing journey. At the begging fishermen spent moderately active lifestyle. During fishing, their activity level was very high and when they returned to land they spent an inactive life. Daily average BMR of the fisherman was 1595 kcal. per day. TEE was calculated separately for three activity levels (Table 5).

Table 4. TEE of the fishermen in different activity levels

Stages	Average number of days	Activity type	TEE (kcal/day)
Seeking fishing ground	6	Moderately active	2473
Fishing	11	Very active	2757
Retune to the land and resting days	4	Sedentary	1915
Full journey	21		**2515**

(Source: Compiled by the author based on survey data 2014/2015)

The overall wasted foods were 11% due to unfavorable weather conditions and carless handling. The

donated foods for other boats were 18%, and the received foods from other boats were 18%; because of that food sharing effect was neutralized. The remained foods were 8% at the end of the journey. The consumed foods were 81%. Overall energy intake was 3535+785 cal. It was significantly higher than the recommended daily energy intake value (P=0.00). Taking calories more than expenditure was influenced for the weight gain. Body Wight of the fishermen was enhanced during the fishing journey.

6.5 The BMI values of the fishermen

Average weight was 69 + 13 kg and average height was 1.67 +0.07 m.

Table 5. The BMI values of Multi-day fishermen

BMI category	BMI value	Percentage of the fishermen (%)
Under weight	<18.5	8
Normal weight	18.5-25	29
Over weight	25-30	47
Obese	>30	16

(Source: Compiled by the author based on survey data 2014/2015)

There was a positive correlation between the individual calorie intake and the BMI (r = 0.756, P value = 0.001). The normal weight exceeded percentage was 62 and that increased the risk of non-communicable-diseases The qualitative interviews revealed that the multiday fishers retires at 52 years old, because most of them had high blood sugar level, cholesterol, heart attacks and high blood pressure.

7 Conclusion and Recommendations

Even though fishermen do not have the access for food outlets and shops in the sea they do not suffer from food scarcity due to over storage of foods. The foods sharing relationship among other boats is very important for food security and that increase accessibility of fresh foods for fishermen. The fishermen do not concern to have a balance diet. Consumption of carbohydrate and protein food exceeds the standard levels. The fruit and vegetable proportion is very poor. The calorie intake and food varieties do not constant during entire fishing trip. Within first two weeks fishermen have lots of varieties and gain more calories but during the middle part of the journey food consumption quantities and varieties are gradually decreasing. In the return journey, though they consume few varieties of foods their calorie intake is high. When concern the overall boat trip, fishermen consume more than their energy requirement which cause the weight gain and It causes to prevail overweight condition among the fishermen.

The back bone of fishing industry is fishermen. Hence policy makers should be more concerned about their health. Over consumption of foods, imbalance diet and overweight could be harmful for their health. To mitigate this problem, awareness programmes should be hold among fishing communities to select proper varieties and adequate quantities of foods with in their budget.

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