CHAPTER - I

INTRODUCTION

In India, fishing is a huge industry employing more than 14.5 million people and ranks third in fisheries production. It is a huge sector in India that gives nutrition and food security to a wide-reaching population living in it (FAO, 2006). Marine fisheries are important in India because it caters livelihoods to coastal inhabitants, who are impoverished in resources with no other alternate to make a living. As per the Marine fishing census 2016, there are 3477 fishing villages with 89,33,000 fisherfolk families. Out of them 81,85,000 families (about 92 per cent) were traditional or artisanal fishing families (Parappurathu et al., 2020).

Fisherfolk lives a poor-quality life and in substandard conditions. The main reason could be the congested living of all fishermen population along the coastline. This resulted in the packing of 222 fishing villages in a stretch of 590 kilometres in Thoothukudi district, Tamil Nadu and these villages are within half a kilometre from the seafront. It makes the life of the fishermen face unfortunate consequences due to weather changes and natural calamities. Other conditions like inadequate housing conditions, illiteracy, poor health, etc., leads to utter poverty and socio-economic paralysis (Rajadurai et al., 2020).

The average annual and monthly earnings of Indian fisherfolk from 2011-12 to 2016-17 is presented in Table I.

Table I

Indian Fishermen Average Income Status

Years	Annual average Income of fishermen	Monthly average Income of fishermen
2011-12	37,298.31	3108.19
2012-13	39,084.98	3257.08
2013-14	41,893.59	3491.13
2014-15	45,060.64	3755.05
2015-16	49,735.43	4144.62
2016-17	52,653.37	4387.78

Source: Marine Fisheries Census 2016

According to the Marine fisheries census 2016, the Indian fishermen families below the poverty line (BPL) accounted to 60.57 per cent. The socio-economic conditions of the fisherfolk in India are significantly low. Fisherfolk on a large scale are not much into education and live under very poor housing conditions. A low income from fishing

and large members in the brood compels the fishermen to borrow credits to fulfil their basic needs (Bijayalakshmi and Ajitkumar, 2014). Tapashi and Methra, 2014, in their study had reported that the earnings from fish farming were too low (between Rs. 20,000/- to 30,000/- p.a.). Most of them took financial help from relatives and friends for their day-to-day investments. Poverty, lack of marketing means and lack of professional education and qualification are the major hurdles confronted by them.

The Marine fisheries resources with the fishermen population of India is presented state wise in Table II.

Table II

Fishermen Population and Resources of Coastal States and Union Territories of India

District	Coastal length (km)	Landing centers	Fishing villages	Fishermen Families	Traditional Fishermen families	BPL Families	Fisherfolk Population
Andaman & Nicobar	1912	57	169	5944	4486	1486	26521
Andhra Pradesh	974	350	533	155062	152062	150669	517435
Daman- Diu	27	12	12	3163	3094	20	15836
Goa	104	34	41	2986	2922	650	12651
Gujarat	1600	107	280	67610	64395	19123	354992
Karnataka	300	115	162	32479	3087	27312	157989
Kerala	590	204	220	121637	116598	72507	563903
Lakshadweep	132	20	10	4163	3003	1170	27934
Maharashtra	720	173	526	87717	80906	27400	364899
Orissa	480	73	739	115228	92569	48601	517623
Pondicherry	45	41	39	14347	14328	12968	50270
Tamilnadu	1076	301	575	201855	196784	183683	795708
West Bengal	158	66	171	81067	56447	55301	368816
	8118	1547	3477	893258	818491	600890	3774577

Source: Marine Fisheries Census 2016

The traditional or artisanal fishing families who use small-scale, low technology, low-capital fishing practices undertaken by individual fishing households of Andhra Pradesh are confronting occupational issues onshore and offshore. The fishermen belong to the low socio-economic sector of the population. The fishing villages are territorially far away from township, lacking basic living facilities, a proper transport system and fresh drinking water. With very poor living standards, fishermen face a lot of hardships and difficulties to sustain and earn a living each and every day all around the year. Most of

coastal Andhra Pradesh fisherfolk (97.3%) live below the poverty line (BPL) in comparision with other communities in India. (Jacob and Brahmaji Rao, 2016)

Not much literature regarding the nutritional health stature of artisanal fisherfolk of India is available. Though some scanty studies and cradle level studies in Tamilnadu, Andhra Pradesh and West Bengal do provide a general perspective. A few surveys done by National Institute of Nutrition, Home Science College Agricultural University, Andhra Pradesh and Avinashilingam Institute of Home Science, Coimbatore, provide some picture of the fisherfolk living. But livelihoods of fisherfolk in every aspect have not been explored to depth. The yearly appraisals organized by National nutrition monitoring bureau, ICMR, and National sample survey prosecute the data district wise which is not of much help to project the nutritional status of a fisherfolk as a community (Bhavani, 1988).

Many factors such as the socio-economic, cultural and climatic conditions of the living environment regulate the physical and mental growth in children. Individualized community studies on nutritional status of the children in a state or region of a country may help to identify elements that govern their growth and development and also to sketch out and execute appropriate plans for controlling and averting under-nutrition (Raghuvanshi et al., 2020)

Children in developing countries are the most vulnerable when it comes to health and malnutrition. Especially children belonging to the fishermen community face many challenges in their day-to-day life as they are proverbially poorer and are more exploited than other children. Fisherfolk children living in poverty and other difficult conditions may not have a proper education from their homes. Although boys at times show an inclination towards school, they are inevitably brought to learn fishing at a very young age. Both, the skills to be learnt for fishing and their education collide with each other. Traditionally fishing communities all over the world have been marginalized. They hardly receive the benefit of education because of their poverty and other kinds of vulnerabilities. Even when efforts brought together to spread schooling to all parts of the population, the fishing population lacks behind in utilizing these opportunities. Fisherfolk believes that if children, especially boys if they do not acquire knowledge in marine fishing at an early age, they could never be skilled in the art of fishing later in their life. To learn the traditional way of marine fishing, the boys have to give up school education. Girls learnt to market, processing fish and taught to spend most of their time taking care of household

chores while their mothers participate in fishery-related activities (Santhakumar and Kurien, 2019).

More than half of India's child labourers work in agriculture, including fisheries and aquaculture. Children are also engaged in work in the Fisheries and aquaculture sector. They help to capture fish and other aquatic creatures and in other fishing related operations, such as building of boats, fish processing, selling of fish and in making of nets. Children of fisherfolk are taught all household chores and are actively involved in upbringing of their younger siblings. Child labourers are employed for labour because it cuts fishing costs. It is harmful for overall development of the child and can also affect the viability of the fisheries activity and the economy (FAO and ILO, 2013)

Gibson, et al. (2020) in their research revealed about the dietary consumption of mother-child duo of fishermen families. They revealed that over 50 per cent of pairs didn't meet the minimum required dietary recommendation. Fish, being available food source for them and also rich in protein and other nutrients was not introduced in infants and young children's diets. Fish was forbidden due to their taboos and fear that its consumption brings about allergies and illnesses. Moreover, their financial and social variables affect their access to nutrient-dense foods. Isolation is another variable that shows impact on their food choices and consumption. Another study showcased a significant decrease in the intelligence quotient (IQ) of fishermen children and they have low academic performance due to deficiency of mineral iron in their diet. Zinc intake was almost half of the RDA that can cause development and intellectual delay in its in-sufficiency and may harm IQ. Suggestions to enhance nutritional education and Family Welfare program to enhance the nutritional status and IQ of the fisherfolk children (Sathe and Gokhale, 2019).

Financial dearth, availability of food and illiteracy are three leading causes of malnutrition (Khattak et al., 2017). Malnutrition is associated with impoverishment as high incidences of undernourishment were found in communities suffering from destitution. Micronutrient deficiencies like vitamin A deficiency, anaemia, zinc, etc. in women and children are seen in under-developed or developing countries. All these deficiencies coexist. (Siddique et al., 2020). Nearly two billion people living on this planet or approximately 1/3rd of the mankind are affected by micronutrient deficiencies and 34 per cent of the 6.25 billion people in this world suffer from iron deficiency. Approximately 28 lakh child mortalities are witnessed every year in Asian countries e.g., India inclding other eight countries (Sujatha and Kowsalya, 2018).

Protein-energy undernutrition (PEU), iron-deficiency anemia and vitamin-A disorders are some of the issues that afflict Indian children. High prevalence of malnutrition among young children are caused due to faulty feeding practices for newborn and children, debilitated absorption and utilization of nutrients caused to due frequent exposure to disease and illness, scarcity of nutriment and wellness facilities, degraded environmental situations, lack of efficient child care practices, unawareness and ignorance of food requirements and absence of a responsible adult caregiver (Ghosh and Shah, 2004).

Malnutrition among children is a cause of concern in India. Due to this, the country has a setback to reach development goals for health. If we compare with the neighboring countries, India leads in the severity of clinical and asymptomatic vitamin A disorders among vulnerable population.

Reports of Nutrition Monitoring Bureau (NNMB) survey showed that around 62 per cent preschool children in India suffer from vitamin A deficiency. Low serum levels < 0.35 μ mol./l was identified in 21.5 per cent. In India, vitamin A deficiency is prevalent in 17.54 per cent while stunted and anaemic children showed to have more of this deficiency disease (Kundu et al., 2021).

The study by National Nutrition Bureau (NNMB, 2003) show an occurrence of 61 per cent of asymptomatic vitamin-A disorder (VAD) at national level. Over-all frequency in occurrence of Bitot spots among infants and preschoolers was noted to be 0.8 per cent, which ranged from nil in the State of Kerala to a maximum of 1.4 per cent in the State of Madhyapradesh followed by 1.3 per cent in Maharashtra and 1.2 per cent in Andhra Pradesh. The overall prevalence of night blindness was about 0.3 per cent. Conjunctival xerosis was about 1.8 per cent (Laxmaiah, 2006).

Vitamin A deficiency is aboriginal nutritional disorder especially plaguing the health of newborns, infants, children, pregnant and lactating women in this world. As the requirement of additional nutrients is increased and the stress levels go high during these life-stages chronical deficiency of vitamin A is common. 127 million 1-5 years children and seven million expectant women globally suffer from vitamin A deficiency. Xerophthalmia is seen in 4.4 million preschool children. Night blindness was seen in six million mothers during pregnancy (West, 2003).

Women of reproductive age and children under five years in Madhya Pradesh reported to have Vitamin A and Vitamin D deficiencies in 74.6% of women and 52.0% in children. The researchers suggested that by increasing the supply of fortified foods with added micronutrients to all sectors of population could lessen the problem of micronutrient deficiency. (Kaur, 2015).

Vitamin A disorders are a communal wellness issue in the southern Indian tribal people where night blindness and xerophthalmia continue to be a big problem. The prevalence of VAD among eight years old children was 10.2 per cent. Around 3.8 per cent women of the reproductive age-group have VAD. Studies reveal that no proof of association between the outcome of vitamin A deficiency and variables like literacy and pregnancy was available. (Muliyil et al., 2019)

The two main reasons for children to become Vitamin A deficient are 1) mother being deficient in vitamin A, thus resulting in the production of breastmilk with reduced vitamin A and 2) they are fed with foods that do not provide the vitamin-A requirements of children. Another factor plays a crucial part in vitamin-A deficiency. Illness caused in children due to infections increases malabsorption and increased breakdown of large molecules of living cells which further deteriorates their vitamin A status (Miller et al., 2002).

Young children with lenient signs of vitamin A disorders are more prone to morbid and mortal conditions. Insufficient ingestion of foods rich in vitamin-A in addition to less absorption and repeated infections are the elements accountable for the occurrence of VAD. The National Vitamin A prophylaxis programme started in 1970 to tackle the vitamin A disorders. With inadequate coverage and poor implementation of the program, a need for policy change is required to focus on the targeted instead of the universal population. Bio-fortified food interventions in addition to public health measures helps to eradicate vitamin A deficiency (Vijayaraghavan, 2018).

The coverage of Vitamin A supplementation during 2015 and 2016 has been dribbled by more 50 per cent in areas which have elevated infant mortality rates, thus, leaving vulnerable lives unprotected. Vitamin A boosts immunity and provides life-saving protection to children. The increase in figures of unprotected children living in countries with high mortality rates has multiplied three times between 2015- 2016, shooting up from 190 lakhs to 620 lakhs (UNICEF, 2018).

Anaemia can arise due to deficiencies of vitamin A because, it effects the iron metabolism, hematopoiesis and more liability to infection (Semba et al., 2002). There is a significant association between iron-deficient anaemia (IDA) and vitamin A deficiency (VAD). Supplementation of vitamin A rich foods showed significant increase in haemoglobin levels and other iron status indices in children (Al-Mekhlafi et al., 2013).

Population with low economic status and poor earnings tend to have the same diet with most of the energy coming from starchy staple foods. Introducing them to a variety of nutritious foods grown locally would be beneficial to improve their Vitamin A status among them (Ted Grenier, 2013). The most effective way to overcome Vitamin A deficiency is through food-based strategies like variegation in diet which comprises of supplementation of food, interventions based on horticulture, food distribution management and availability of foods with elevated vitamin A content. Nutritional pedagogy covering all aspects related to deficiencies, prevention and goodness of fortified foods related to vitamin A should be spread. (Chakravarty, 2000).

National Nutrition Policy in 1993, set a goal to control deficiency disorders of vitamin A by implementing the national vitamin A prophylaxis programme. Prevention and treating of nutritional blindness in India includes consuming locally available foods rich in vitamin A through dietary variegation and community support and administration of accurate dose of vitamin A (Laxmaiah, 2006).

Most people who are prone to Vitamin A disorders acquire about 82 per cent of the required vitamin A from plant-based foods rich in pro-vitamin A. An orange-fleshed sweet potato is a powerhouse of β-carotene (Betty J. Burri, 2011). In Ugandan family house-holds supplementation of orange fleshed sweet potatoes hiked the vitamin A levels among the subjects and was proved to enhance their nutritional stature (Hotz et al., 2012).

Inconsistent eating of food in coastal Rayalaseema and Telangana was far less than the recommended dietary allowance. The diet mainly consisted of cereals which provided 74 per cent of the energy. About 30-40 per cent of the population were undernourished in those regions. The prevalence of nutritional deficiency is more common among the poor, people with no asserts, scheduled caste and scheduled tribes (Reddy, 2010).

Various variables like food security, income, socio-economic stability, sanitation and communal isolation play an important role in the nutritional status of fisherfolk

children. The need increases for consideration of formulation and prioritization of nutrition programs for children in this occupational group. Possible interventions should involve a health and nutrition education program, physical activity, technical education that increases their capacity, environmental sanitation and personal hygiene. Health, nutrition and welfare of fisherfolks should be brought to limelight in a national level (Capanzana, 2018).

In the face of continuing poverty and malnutrition, an alternate strategy for development becomes a priority giving rise to several interventional programs. Holtz et al. (2012) in their research stated that the consumption of orange-fleshed sweet potato helps in alleviating vitamin A disorders. They have also reported that large-scale intervention to introduce orange-fleshed sweet potato as a staple food, into the diets of women and children to improve their vitamin A status and minimizes the risk of dietary vitamin A deficiency. Pro-vitamin A-rich sweet potato works as a perfect strategy to reduce vitamin A disorders particularly in children and women in developing countries (De Brauw et al., 2019).

Sweet potato, botanically called as Ipomea Batatas, is a dicotyledon which belongs Convolvulaceae family. It grows in tropical and subtropical areas. They come in many colours like white cream, yellow, orange and purple. The orange-fleshed sweet potatoes (OFSP) are a relatively an epitome of energy, easy to cultivate, asexually reproduced and can withstand drought once the plantation is set up. It is known to have a high amount of beta carotene with high bio-availability, which our body converts to vitamin A retinol. Just 100-125 grams of cooked OFSP is sufficient to match the recommended daily allowance in children. (Kurabachew, 2015). OFSP is a chief food in several tropical regions. The yield of sweet potatoes has exceeded that of rice. The new biofortified Orange fleshed sweet potato varieties (OFSP) are being produced in Andhra Pradesh and have reported to contain elevated amount of beta carotene (Provitamin A) (Ashok et al., 2017).

Orange fleshed sweet potatoes (OFSP) have an eye-pleasant colour, good flavour and texture which makes it acceptable for human consumption. With elevated concentrations of beta-carotene, OFSP also has calcium, magnesium, zinc, sodium, phosphorus and potassium in considerable amounts. Iron is also found in a fair concentration in OFSP. Finally speaking, OFSP is an excellent secondary staple food for the developed countries (Neela et al., 2019).

Supplementation, fortification, dietary diversification and nutrition education are the general ways to improve Vitamin A status. India has been implementing the national vitamin A supplementation programs in the last 40 years. But the programme has achieved less than 25 per cent indemnity and hasn't been held out to many rural populations (Stein et al. 2006).

Many studies centred on the robustness of OFSP, claim that it is one of the healthy foods extensively used for vulnerable people. Orange-fleshed sweet potato is proved to be one of the most triumphant exemplar biofortified staple food which could help in prevention and controlling vitamin A deficiency. They also stated that though the major approach is focused on unprocessed, boiled orange-fleshed sweet potato (OFSP), there are an ample probability for processing OFSP (Laurie et al., 2017).

To address the micronutrient malnutrition, especially vitamin A deficiencies, anaemia, zinc deficiencies and folate deficiency in the targeted populations, biofortified staple foods can be of great help. The WHO and FAO of the United Nations are focused on enhancing the micronutrient content of chief crops grown in under-developed nations. (Garcia-Casal et al., 2017) Among the staple crops OFSP is rich in beta-carotene (Low et al., 2017). Research and studies have proved that OFSP elevates the nutritional status of the most affected areas of the world (Sharma et al., 2016 and Low et al., 2017).

FAO stated that food and nutrition education at school with a series of educational activities and environmental supports will help school children, teachers and parents to learn and incorporate healthy changes to their diets and other food related practices. This would bring about all-round improvement in their knowledge, attitude and practices. Nutrition education provides the amplitude to change and alter their perspective and to transfer their knowledge to others (FAO, 2020).

Children eating patterns and behaviour are motivated by the food domain administered in the household and their personal food experiences. Children eating behaviour is mirrored by parents eating behaviour. As childhood is a crucial stage for developing eating patterns that would continue throughout adulthood, the change in healthy eating behaviour could be shaped at this stage. Keeping in view about the healthy food choices in children for their healthy growth and development, nutrition education intervention successfully enhances behavioral change associated with food intake. Nutrition education plays a prominent part in conveying the messages associated

with significance of health, good nutrition and food choices to school children (Mahmudiono et al., 2020).

A well designed and properly implemented school and family-based education programmes increases the fruit and vegetable consumption in children. Incorporation of role models whom children would get inspired like their friends or teachers or famous celebrities, sports icons, etc to nutrition education increases the acceptance of healthy foods in children. School nutrition programs were equally effective as any other programs in communities. These programs were also effective to bring about change in economically backward communities (Black, 2017).

Interventions of nutrition education in schools which includes school-gardening are widely in use to increase the aspiration and liking in children to eat vegetables and fruits. The knowledge of vegetables and fruits consumption in children improves their outlook and ability to increase the consumption of vegetable and fruit in their diets (Hutchinson et al., 2015). Implementation of a nutrition education intervention programmes such as cooking workshops, videos and photovoice (photo- elicitation and digital story telling) brings about possible changes in food habits in households as well as in communities (Fretes et al., 2013).

There is limited information available about the impact of supplementation of OFSP supported by nutrition education and its impact on the nutritional profile of fisherfolk children in coastal villages of rural Kakinada, Andhra Pradesh. In the absence of any ongoing interventions for children suffering from vitamin A disorders and iron-deficient anemia in coastal regions in rural Kakinada, this research was conducted to assess the outcome of nutritional inventions on vitamin A and iron nutriture of school children (6-8 years) from fishermen community.

Objectives of the study

The current research work was an attempt with the following objectives:

- Assess the nutritional status of school-going children (6-8 years) boys and girls belonging to fishermen communities in the coastal regions of Rural Kakinada of East Godavari District
- Assess the prevalence of vitamin A and iron deficiencies in the selected children of the Fishermen community (6-8 years).
- Standardization and evaluation of the Vitamin A rich supplement.
- Assess the effect of supplementation and nutritional education in improving the nutritional health in children.

Hypothesis

It has been hypothesized that:

- The intervention of Vitamin-A rich food helps to decrease the subclinical deficiency seen in children of selected fishermen communities.
- Nutrition education has a positive impact on improving knowledge and food choices for better health.