2

REVIEW OF LITERATURE

In this chapter, an attempt has been made to present the collected reviews related to this study and discussed under the following aspects.

A. General Demographic Profile and Lifestyle Pattern of Tribal Young Girls

B. Nutrition Requirements and Malnutrition among Tribal Young Girls

C. Nutrition Programmes and Schemes Initiated in India for the Benefit of Tribal Girls

D. Nutritional and Reproductive Health Knowledge among the Tribal Girls

E. Importance of KAP and Effect of Nutritional Interventions on Nutritional Knowledge and Health Status of Tribal Young Girls

A. General Demographic Profile and Lifestyle Pattern of Tribal Young Girls

a. General demographic profile

According to Ministry of Tribal Affairs (MTA, 2019) India has a large number of tribal people. Tribals are called by different names such as "primitive, 'tribal,' 'indigenous,' 'aboriginal,' 'native,' and so on. The inclusion of a community as a Scheduled Tribe is an ongoing process. The essential characteristics, first laid down by the Lokur Committee, for a community to be identified as Scheduled Tribes (ST) are: a) indications of primitive traits; b) distinctive culture; c) shyness of contact with the community at large; d) geographical isolation; and e) backwardness. Tribal communities live, in various ecological and geo-climatic conditions ranging from plains and forests to hills and inaccessible areas. Primitive tribals experienced pre-agriculture level of technology, stagnant or declining population, extremely low literacy and subsistence level of economy were the common.

Tribals (Adivasis) in Kerala are the indigenous population found in the southern Indian state of Kerala. Most of the tribal people of Kerala live in the forests and mountains of Western Ghats, bordering Karnataka and Tamil Nadu. The tribal population constituting 1.45 percent of the total population in Kerala. Considering the district wise distribution of tribal population in Kerala State, Wayanad has the highest number of tribals (151443) and

Kannur has 41371 total tribal populations. Kannur district is divided in to five taluks namely Thaliparamba, Kannur, Thalasseri, Iritty, and Payyannur. Wayanad district is divided in to three taluks as well; namely Manathawady, Kalpatta, and Sultan Battery. The population distribution of the selected areas as per the census 2011were described below (Table I). Total area of the habitation, number of households, total population and tribal population with male and female sorting is given in this Table 1.

Table 1: Area wise distribution of the population*

Habitation	Area in Sq. Km	Number of Households	Total Population			Tribal Population		
			Female	Male	Total	Female	Male	Total
Kerala (State)	38852	7853754	17378649	16027412	33406061	246636	238203	484839
Kannur (District)	5708.29	552918	1341557	1181446	2523003	21230	20141	41371
Iritty (Taluk)	372.26	41361	95632	89959	185591	3808	3725	7533
Aralam (Gram Panchayat)	123.9	6904	14890	14438	29328	2198	2161	4359
Wayanad (District)	2130.0	190894	415736	401684	817420	76967	74476	151443
Sultan Battery (Taluk)	803.11	70598	147499	143358	290875	14995	15445	30440
Pulpally (Gram Panchayat)	76.72	6977	14273	14049	28322	2888	2853	5471

*source: Censes (2011)

It is estimated that there are about four lakh tribal people living in Kerala and about half of this population has made the interiors of Wayanad their home. The tribals were the original inhabitants of Wayanad region. But once the British era opened roads to this region and commercial plantations began to sprout, there occurred a migration of settlers to this region and during the 1940s this migration enhanced tremendously displacing the aborigines or adivasis of the area. The tribes lost their land and dwindled in numbers and now they constitute only 20 percent of the total population of the district (KIRTADAS, 2017).

The native Adivasis of the district belong to various sects like Paniyas, Kurumas, Adiyars, Kurichyas, Ooralis, Kattunaikkans and UraaliKurumas. They are mostly physically

distinguishable with darker skin and stout built physique. They often live in houses made of thatched roof, mud, bamboo and brick houses set in swampy valleys and plateaus. Though many of the tribals said to be primitive tribes, all of them have a story of migration to the hills. “The story of tribes on the Western Ghat mountainous ranges have is less than 300 years”, says PhiliposeVaidyar (KIRTADAS, 2015) who had visited and stayed with several of these tribal groups. Cholanaikkan is said to be the most primitive and a vanishing tribe.

Tribal people groups who are food-gatherers, with diminishing population and very low or little literacy rates can be called as Primitive Tribes. Cholanaikkans, Kurumbas, Kattunaikans, Kadars and Koragas are the five primitive tribal groups in Kerala. They constitute nearly five percent of the total tribal population in the Kerala State. Cholanaikkans can be said as the most primitive of them and found only in the Malappuram District. Only a handful of families are living in the Mancheri hills of Nilambur forest division. Kattunaikans, another lower-hill community related to Cholanaikkans, are mainly seen in Wayanad district and some in Malappuram and Kozhikode districts. Kadar population is found in Trisur and Palakkad districts. Kurumbas are living in the Attappady Block of Palakkad district. The Koraga habitat is in the plain areas of Kasaragod district. The Paniya (Paniyar) are the largest of the 36 major tribes. As per the list of the Government of Kerala (2011), there are 36 Scheduled Tribes in the state of Kerala and listed in Table 2.

According to the study of Luiz (1962) about the Kerala tribal communities, list of 48 tribal communities. Somasekharan Nair (1976) estimated the number is 41, and in 2011 the total number of tribal communities were 36. This data revealed that from the year of 1962-2011, there was a noticeable decline in the number of the tribal communities.

Table 2: Name of the tribal communities of Kerala State

S/N	Scheduled tribes in Kerala		
1	Adiyan	19	Malankuravan
2	Aranadan	20	Malasar
3	Eravallan	21	Malayan, (Malyan, Konga Malayan)
4	Hill Pulaya (Kurumba Pulayan, PambaPulaya, Mala Pulaya, KaravazhiPulayan)	22	Malayarayan
5	Irular, Irulan	23	Mannan
6	Wayanadu Kadar (Kadar)	24	Muthuvan, Muduva, Mudugar

7	Kanikar, Kanikaran	25	Paliyan, Palleyan, Palliyar
8	Kattunaykans	26	Paniya, Paniyan
9	Kochuvelan	27	Ulladan
10	Koraga	28	Uraly
11	Kudiya, Melakudi	29	Malavettuvan
12	Kurichiyan	30	Then Kurumba
13	Kurumans (Mala Kuruma, MulluKuruma)	31	ThachanadanMoopan
14	Kurumbans	32	Cholanaickan
15	MahaMalayar	33	Mavilan
16	Mala Arayan	34	Karimpalan
17	Mala Pandaran	35	VettaKuruman
18	Mala Vedan	36	Mala Panikkar

b. Lifestyle pattern

Rajasenan et al (2013) reported that, tribes in Kerala underwent serious health issues. Recent change in land use pattern and land alienation has adversely affected their traditional livelihood leading to food insecurity. Poverty, lack of hygiene, inadequate infrastructure, and various health problems are fueling the fire. The livelihood options of the tribes are predominantly primitive in nature (Throat, 2009) with minimal dependence on other means of employment. Communities like Kattunaikas still depend upon forest for hunting, whereas others work as agricultural or non- agricultural laborers (Wayanad Initiative,2006).Studies conducted by (Rajasenan et. al 2013) on nine prominent tribal communities of Kerala from Wayanad ,Idukki and Palakkad shows that health status of tribal population is not robust as they are very much below the state average in terms of most of the health indicators of morbidity, mortality, infant mortality and other demographic features. This is because of their peculiar habits like drinking and use of tobacco (Kannan et. al, 1991). Health pattern is inferred by compiling their perception of own health situation as well as data regarding the stage of visiting medical practitioner, stage of ill- health, loss of work-days due to illness and their ill health practices such as consumption of alcohol and tobacco. (Rajasenan et al 2013).

Tobacco use is associated with a wide range of major diseases, including several types of cancers and heart and lung diseases. According to NFHS-4 (2015-2016), the percentage of ST women and men age 15-49, who use any kind of tobacco is highest when compared to any other social group (26.3 percent for women and 71.2 percent for men). NFHS-4 finds that among all social groups, drinking is common among half (49.9 percent) of the ST men

and 14.1 percent of ST women. ¬Only 2.6% of ST households have a member with health insurance, the lowest among all social groups.

Only 27 percent of ST women visited a health facility or camp for themselves or their children in the three months preceding the survey and majority of them reported that the health care provider was responsive to their problems and needs. The ST women were found to be mostly prevented from getting medical treatment from a health facility for themselves, due to distance (44 percent reporting it). 28.4 percent of ST women report concern that no female provider will be available as being a big problem compared to 18.7 percent of total women (Special Bulletin on MMR, June 2011).

Education forms an important component in the overall development of individuals, enabling them to greater awareness, better comprehension of their social, political and cultural environment and also facilitating in the improvement of their socio-economic conditions. For the Scheduled Tribe Population in India, the Literacy Rate (LR) increased from 8.53 percent in 1961 to 58.96 percent in 2011 for STs while the corresponding increase of the total population was from 28.30 percent in 1961 to 72.99 percent in 2011 (Censes, 2011).

In the case of tribals, dropout rates are still very high – 35.6 percent in Classes I to V; 55% in Classes I to VIII; and 70.9 percent in Classes I to X in 2010-11 and significantly higher than the all India figures. The data revealed that, out of every 100 ST students who entered class-I, while almost 67 completed class V, only 41.9 completed class VIII and 13.9 studied up to class XII. However, dropout rates are considerable lower in the Classes I - V than the higher classes (I to X). This indicates that the dropout rates are alarmingly higher in the higher classes (Statistical Profile of Scheduled Tribes in India, 2013).

B. Nutrition Requirements and Malnutrition among Tribal Young Girls

a. Adolescence- a crucial stage in the life cycle

Chouthaiwale (2011) stated that about 84 percent of adolescent population is living in developing countries and growth of adolescents has outstripped that of any other age group. The population of India indicated that the number of adolescents will increase from 200 million in 1996 to 215.3 million in 2016, but the nutritional concerns of adolescents have largely been neglected. Adolescents in India comprise nearly 22 percent of the total

population and their numbers are increasing steadily. In particular, adolescent girls constitute nearly 47 percent of Indian population, forming a crucial segment of the society. Adolescence is a period between the ages of 10 and 19. Beyond the working definitions, adolescence is generally considered to begin with puberty and the development of the secondary sexual habits characteristics. The end of adolescence is harder to define and is recognized differently by different cultures (Kale, 2011).

The period of adolescence serves as social apprenticeship filling the interim between biological maturity and sociological adulthood. Swarnalatha and Yegammai (2006) stated that the adolescence is the period between childhood and adulthood with accelerated physical, bio - chemical and emotional development. Adolescence is the age of physical and mental development, emotional transition, curiosity, energy, creativity and desire to learn, and also pointed out that adolescence is a period of transition from childhood to adulthood. It is characterized by rapid physical, biological and hormonal changes resulting in psycho - social, behavioral and sexual maturation. stated by Bamji et al (2018).

Adolescents are at an age of transitioning from parental supervision to independent decision making and are developing food patterns that will affect their future (Bakshi and Singh, 2012). Adolescence is a significant period of human growth and maturity and during this phase of life unique changes occur in an individual, adult patterns are established following early childhood. The most crucial segment of our population from the point of view of quality of our future generation is today's young girls who are on the threshold of marriage and motherhood. During this period, the somatic growth is completed, biological, cognitive, physiological and social characteristics are changed (Arya, 2011). On the basis of available data on the growth of adolescent girls, it is crystal cleared that a remarkable percentage of adolescents are found to have low body weight and less height (Jondhale et al, 2001).

Adolescence is the period during which iron deficiency is most prevalent due to higher requirements, especially in girls owing to menarche. Adolescence requires more iron from the age 12 years onwards (Dhore, 2011). Adolescent girls, the future mothers are married off as soon as they attain 18 years of age, in India. After marriage, they usually conceive in a short period of time. Adolescence is therefore, the right time period for the girls to be properly nourished for proper growth and development (Rajwade, 2011). According to Shekhar (2005), adolescence is a vulnerable period in human life cycle when nutritional

requirements increase due to the adolescent growth spurt. Rapid growth rate coupled with inappropriate nutrient intake increases the risk of micronutrient deficiencies among this adolescent population. These changes demand extra nutritional requirements for girls, especially that of iron (Dripta et al, 2011).

The development in adolescent period is categorized into three main stages; early adolescence (9-13 years), mid - adolescence (14 - 15 years) and late adolescence (16 - 19 years). Early adolescence is characterized by growth spurt - physical development of secondary sexual characteristics like development of the breasts, enlargement of hip region and the initiation of menstruation. Mid - adolescence consists of widening of hips, hair growth in genital and arm pits; development of separate identity from parents; new relationship with the peer groups and opposite sex and an urge to explore new things. Late adolescence shows growth in external genitalia like enlargement of vagina, growth in internal organs such as uterus, development of physical characteristics similar to adults (Kala. A, 2015).

Adolescence is an ambivalent period full of stress and strain. The core psycho - social developmental problem of adolescence struggle with is that of identity vs role diffusion (William, 2005). Psychosocial development continues over a much longer period. The pressure for peer - group acceptance is strong and fads in dress and food habits are common in a developing society like India, where high values are placed on education and achievement. Prolonged preparation for careers often delays marriage and family far beyond the initiation of the reproductive years. These conflicts may have nutritional consequences as teenagers eat away from home and often develops a snacking pattern of personal and peer group food choices. Currently, there is much concern regarding the dietary habits of teenagers, especially as they affect physical, physiological and emotional development. Many young adults skip breakfast. The reasons commonly cited are, being in a hurry, lacking time, having no appetite, preferring to spend more time on personal appearance, trying to maintain weight and having no company to eat with. In recent years, snacking by teenagers and common concern over this habit has been on the rise. Daily snacks may make up one fourth to one third of the adolescents' RDA of calories. Girls snack more frequently and they do have eating behavioral problems and eating disorders than boys (Wardlaw, 2009).

According to Gibney et al (2005), eating disorders are psychological illnesses in which distress is manifested in the forms of disordered eating patterns. This has damaging

effects on nutrition, physical health, mood and cognition which serve to reinforce the destructive spiral. A number of epidemiological studies report that, mild eating disturbances at a subclinical level exists widely in adolescents in the age ranging from 11 to 18 years. Eating disorders rank high amongst the chronic conditions of adolescents.

Gibney et al (2005), classified eating disorders into three variants: anorexia nervosa, bulimia nervosa and binge eating disorder (BED). Bulimia is a condition in which people repeatedly eat large amounts of food. Bulimia also grows out of a person's need for control of her body. Like anorexia bulimia is also most common among adolescent girls. Many people with bulimia have a desire to be beautiful and to have a perfect shape. After they eat a lot of food, they become panic that they are losing their body shape. They may force themselves to vomit the food, believing that this will put them back in control.

In 1994, binge eating disorder, commonly known called as compulsive overeating, was recognized by the American Psychiatric Association. In the past the catchall term compulsive overeating is described a range of habitual overeating. Today, health care professionals recognize this condition as complex and serious, as disturbing problem as anorexia nervosa or bulimia nervosa. The prevalence of this disorder is less among the Indian population (2 to 5 percent). However, many people among the general population are likely to have less severe forms of the disorder that do not meet the formal criteria for diagnosis. This disorder is severe among the extremely obese and those with a long history of frequent restrictive dieting (Lauce and Wilfley, 1996). According to Gibney et al (2005), various efforts have been taken towards prevention programs for eating disorders. Usually they have been designed for adolescent girls. Increasing nutrients as well as responsibilities and problems, changing life style, food habits, figure consciousness, peer pressure and behavioral changes affect food intake among adolescents.

b. Food and nutrient requirements for young girls

Nutritional status and physical growth are dependent on one another such that optimal nutrition is a requisite for achieving full growth potential. Nutritional Requirements and Recommended Dietary Allowances (RDA) for Indians developed by the Indian Council of Medical Research (ICMR) provides current quantitative estimates of nutrient intakes to be

used for planning and assessing diets for healthy individuals, including adolescents. The Recommended Dietary Allowance for adolescent girls is given in Table 3.

Table 3: The Recommended Dietary Allowance for Adolescent Girls

Nutrients	Recommended Dietary Allowance*	
	10-12 Yrs.	13-15 Yrs.
Energy (Kcal)	2010	2330
Protein (g)	40.4	51.9
Fat (g)	35	40
Calcium (mg)	800	800
Iron (mg)	27	27
Retinol (µg)	600	600
Beta-carotene (µg)	4800	4800
Thiamin (mg)	1.0	1.2
Riboflavin (mg)	1.2	1.4
Niacin (mg)	13	14
Vitamin C (mg)	40	40
Folate (µg)	140	150
Zinc (mg)	9	11
Magnesium (mg)	160	210

*NIN 2016

Energy: Energy needs of adolescents are influenced by their activity level, basal metabolic rate and increased requirements to support pubertal growth and development. They need additional energy for growth and activity. To meet these calorie needs, adolescents should choose a variety of healthy foods. In an attempt to meet their energy needs, adolescents can fall prey to unhealthy, coercive and aggressive advertisement. They must therefore be well informed in the choice of healthy foods both at home and in school. The adolescent growth spurt is sensitive to energy and nutrient deprivation. Chronically low energy intakes can lead to delayed puberty or growth retardation. Insufficient energy intake may also occur because of restrictive dieting, inadequate monetary resources to purchase food, or secondary to other factors such as substance abuse or chronic illness. (Jaacks (2015).

Protein: Protein needs of adolescents are determined by the amount of protein required for maintenance of existing lean body mass and the development of additional lean body mass during the adolescent growth spurt. Protein is important for growth and maintenance of muscle (NIN, 2011). Most adolescents meet the protein requirement with their intake of meat and dairy products. However, as with energy intake food security issues, chronic illness,

frequent dieting and substance use may compromise protein intake among adolescents. Adolescents who follow vegan or macrobiotic diets are another group that is at elevated risk for inadequate protein intake (Jaacks (2015).

Carbohydrates: Adolescents who are very active or are actively growing will need additional carbohydrates to maintain adequate energy intake, whereas those who are inactive or have chronic condition that limits mobility may require fewer carbohydrates. The brain uses solely glucose as a fuel source, except in extended periods of starvation. The other human organs can use protein and fat for energy but prefer to use glucose when it is available. The intake of recommended amount of carbohydrates provides enough glucose for proper brain function in virtually all healthy adolescents (Kamps, n.d.& Simons, 2013). Adolescents should be encouraged to choose carbohydrate foods that contain fibre and limit sugar. It is required to consume at least 30 grams of fibre per day (NIN, 2016).

Fats: Fats are concentrated sources of energy providing 9 Kcal/g, and are made up of fatty acids in different proportions. Fats serve as a vehicle for fat-soluble vitamins like A, D, E, K and promote their absorption. They are also sources of essential polyunsaturated fatty acids. It is necessary to have adequate and good quality fat in the diet with sufficient polyunsaturated fatty acids in proper proportions for meeting the requirements of essential fatty acids. During adolescence, dietary fat continues to play an important role as an energy source, a significant cell structural component, a precursor to agents of metabolic function and a potent gene regulator. Diets of young children and adolescents should contain about 30 g/day (NIN, 2016). The type of fat rather than its quantity is more important in determining the health consequences of dietary fat. However, ingestion of too much fat is not conducive to good health. Excess intake could lead to obesity, diabetes, cardiovascular disease and cancer.

Vitamins and Minerals: Vitamins and Minerals are called micronutrients because they are needed only in minuscule amounts; these substances are the “magic wands” that enable the body to produce enzymes, hormones and other substances essential for proper growth and development. Micronutrient needs are elevated during adolescence to support physical growth and development. However, micronutrients involved in the synthesis of lean body mass, bone and red blood cells are especially important during adolescence. Vitamins and minerals involved in protein, Ribonucleic Acid (RNA) and Deoxyribonucleic Acid (DNA)

synthesis are needed in greatest amounts during the growth spurt; needs decline after physical maturation is complete. However, the requirement is elevated throughout adolescence and into adulthood since bone density acquisition is not completed by the end of puberty (Rachel, 2014).

c. Malnutrition among tribal girls

Tribal population are caught in the vicious circle of poverty coupled with malnutrition, morbidity and mortality. A study conducted on the basis of Multidimensional poverty index by(Richard Scaria et al 2013) in Attapady Palakkad among Irular, Mudugar and Kurumbar tribes show that Majority of tribes lies in the category of severe poverty i.e., tribes in Attappady are affected in more than 50% deprivation indicators. More over pregnant women and lactating mothers were found to be suffering from chronic malnutrition and anemia leading to high infant mortality rates (Hossain et al 2013). Nutrition challenges continue throughout the life cycle, particularly for tribal girls and women. Malnutrition amongst tribal women is one of the prime causes of low birth weight babies and poor growth. India has the highest number of low birth weight babies per year at an estimated 7.4 million (NFHS-4, 2015-2016). Low birth weight (LBW) is a significant contributor to tribal infant mortality. Moreover, LBW babies who survive are likely to suffer growth retardation and illness throughout their childhood, adolescence and into adulthood and growth-retarded adult women are likely to carry on the vicious cycle of malnutrition by giving birth to LBW babies (Mother and Child Nutrition, 2016 & Ray, 2011). Protein Energy Malnutrition (PEM), vitamin A deficiency, Iodine Deficiency Disorders (IDD) and nutritional anaemia mainly resulting from iron deficiency or iron losses are the most common serious nutritional problems in almost all countries of Asia, Africa, Latin America and the Near East (Muller and Krawinkel, 2005).

Adolescence is the most vulnerable stage from the point of view of health. In a country like India, adolescent girls especially tribal girls faces serious health problems due to socio-economic, environmental conditions, nutrition and gender discrimination. A vast majority of tribal girls in India were suffering from either general or specific morbidities. Diet and health are synonymous with the well-being of an individual. In the absence of proper and adequate nutrition a person can develop several developmental malformations. Tribal adolescents remain a largely neglected and hard to reach population especially girls. Thus it is not

surprising that adolescent girl population who are mothers to be is considered as the most important section on which the future of nation depends. The study by Dasgupta et al. (2010), documented that malnutrition affects body growth and development, especially during the crucial period of adolescence (An early marriage and child birth is a major determinant of women's health and is also responsible for the prevailing wide variation in the socio-economic status. Inadequate and improper utilization of health facilities and wide spread anaemia among all the reproductive age women, leading to high maternal mortality (540 maternal deaths per one lakh live births).

Poor health has repercussions not only for tribal women but also for their families. Women with poor health and nutrition are more likely to give birth to low weight infants. They are also less likely to be able to provide food and adequate care for 33 their tribal children. Finally, a tribal women's health affect the household economic well-being and as a tribal women with poor health will be less productive in the labour force. While malnutrition is prevalent among all segments of the population, poor nutrition among tribal women begins infancy and continues throughout their lifetime (Kumar and Khan, 2010).

Vitamin D deficiency is also an important public health problem among tribal older women living in the community but is a preventable disorder and is readily alleviated with dietary supplementation. Calcium and Vitamin D supplementation may help slow bone desorption and increase bone formation (Semba et al., 2000). The health status of tribal population groups is as such a function of the interaction between socio-cultural and socio-biological properties, the genetic attributes and the environmental conditions. The widely varying prevalent health practices, use of indigenous herbal drugs, taboos and superstitious are also responsible for determining the health behavior and health status of the tribal groups. In India, the general health status of the tribal population is known to be poor (Varadarajan et al., 2009).

Poor nutritional status and greater incidence of anaemia among tribal women is noted. Malnutrition is a tragedy for tribal women. The nutritional status of the women is always related to the economic status of the family and here the poverty has played havoc on the health and nutritional status of tribal women (Bentley and Griffiths, 2003). It is found that the post and neonatal mortality rate is higher among the tribals than that of the overall mortality rate of the non-tribals (Niswade et al., 2011). Nutrition knowledge also contributes

to better health status (Leonard, et al., 2014) which is found lacking in the tribal groups. Negligence of health and nutritional care of children is yet another factor which has been responsible for poor health and even deaths among children in such areas. Das and Subba (2015) stated that nutrition is an integral component of health and well-being of an individual. Good nutrients enable one to lead a socially and economically active life and improve the quality of life as evidenced through 34 enhanced nutritional status of tribal population groups, better work, efficiency rate, reduced mortality and morbidity rate by raising the standard of living.

According to a survey report of the National Nutrition Monitoring Bureau (NNMB). It is reported that highest percentage of stunted tribal school children (64-65%) with Odisha and highest percentage of severely stunted tribal children (35%) among the nine tribal states (Sarkar et al., 2015). Vyas and Choudhry (2005) have recognized that iron deficiency is the major cause of anaemia in tribal communities. Apart from low hemoglobin count, there are several other indicators of health which vary with nutritional status. The age of onset of menarche has also been found to vary according to nutritional status. As the nutritional status improves, the age at menarche is lowered (Juliyatmi, 2015). Iron Deficiency Anaemia (IDA) is very common amongst Indians due to several reasons like low dietary intake of malabsorption, excessive sweating and its prevalence varies from 75 per cent among tribal children, women and 45 per cent among tribal adult males (Rao et al., 2015).

Christina et al. (2014) regards tribal adolescence as one of the most exciting yet challenging periods in human development, generally thought of as a period of tremendous physiological, psychological and cognitive transformation during which a child becomes a young adult. Adolescents are tomorrow's adults and 80 per cent of them live in developing countries. India has one of the fastest growing tribal youth populations in the world. Guiseppina (2000) putforth the fact that adolescence is an intense anabolic period which requires all nutrients increases. Adolescents are a nutritionally vulnerable group for a number of specific reasons, including their high requirements for growth, their eating patterns and lifestyle, their risk-taking behavior and their susceptibility to environmental influences. Adolescents are exposed to under nutrition, micronutrient malnutrition as well as obesity. Their lifestyle and eating behaviour along with underlying psychosocial factors are particularly important threats to adequate nutrition (Belperio et al., 2004).

Inadequate nutrition in adolescence can potentially retard growth and sexual maturation, although these are likely consequences of chronic malnutrition in early 38 tribal infancy and tribal childhood. It can affect adolescent's current health and put them at high risk of chronic disease as well, particularly if combined with other adverse lifestyle pattern even if the detrimental effect may take long to slow (Jennifer et al., 2007). In undernourished population, growth rate during adolescence is slower. Using maximum growth spurt or menarche as an indicator, maturation may be delayed in malnourished girls by an average of two years. Iron deficiency is far most prevalent amongst micronutrient deficiencies in adolescents.

Disease such as malaria and hookworm affect both boys and girls, contributing to anaemia by iron status, whereas girls may continue to be or become more deficient because of the increased requirements for iron due to menstruation, pregnancy and lactation. Iron deficiency and anaemia may be common among adolescent athletes, owing to chronic urinary and gastrointestinal blood loss and to intravascular hemolysis that are associated with strenuous exercise combined with endurance events (Parimalavalli and Sangeeth, 2011). Malnutrition or undesirable disease conditions related to nutrition can be caused by eating too little, too much or an unbalanced diet that does not contain all nutrients necessary for good nutritional status. Inadequate dietary intake and disease, particularly infections are immediate cause of malnutrition. Poor diet and disease are often the result of insufficient household food security, inappropriate care and feeding practices and inadequate health care practices (Ramsey et al., 2012). Several studies conducted by Beutler (2011) revealed that deficient intake of calories and protein among tribal population relative to the Indian RDA which may be an explanation for the high rates of stunting among this tribal group.

Nagamani (2014) carried out a study to assess clinical nutritional and micronutrient status profiles, a sample of 362 tribal girls from six areas 41 (n= 120) including scheduled castes (harizan n=90) and tribes (n= 152) were examined. Heights, weights, food intakes and serum micronutrient status were assessed using standard anthropometric, diet survey and biochemical methods. Findings indicate that all the girls studied are far below the ICMR and NCHS standards for heights and weights. Rural girls are better than tribal and harizan girls. Harizan girls are also worst affected.

Food intakes of the girls in all the three communities are far below the ICMR Recommendations. Significantly low values are recorded for serum protein and albumin. The findings suggest that there is an urgent need for nutrition intervention and education

programmes for rural and other socially deprived adolescent girls to support the growth and safe guard the mother child life cycle. According to the study by Kulasekaran (2012), the chronic energy deficiency women produce more number of anaemic children than the counterparts. Around forty percent of the low weight babies are born to the chronic energy deficit women. The burden of chronic energy deficiency indicates that there is a need for special public health programs that are able to address chronic energy deficiency. It is can be concluded that women of the EAG states are facing higher degree of nutritional disorder. It is found from the study that CED is a more severe problem in the EAG states than the obesity problem. The prevalence rate of CED is nearly equal to (33.9%) to the national average (35.6%). Also socioeconomic and demographic variables have a significant influence on the odds of CED in EAG states women. There is a strong association between tribal maternal nutritional status and tribal children's nutritional status and birth weight. Inadequate consumption was noted for all food groups especially for green leafy vegetables, roots and tubers, fruits and milk among 4207 adolescents (14-19 years) of urban and rural areas of Perunambuco state. Tribal adolescent students living in rural areas had a higher prevalence of low consumption of natural fruit juices while those residing in urban areas had a higher prevalence of daily consumption of soda drinks (Nivedita et al., 2016).

As per NFHS-4 (2015-2016) estimates, the under-five mortality rate and the child Mortality rate are much higher for STs than any other social group/ castes at all childhood ages (95.7 and 35.8 respectively). However, it is found that STs have a lower infant mortality rate (62.1) than SCs (66.4) but higher than OBCs (56.6). Even the pre-natal mortality rate for STs (40.6) is lower than other social group/ castes

The Maternal Mortality Ratio (MMR) presented above as reported in the Bulletin has been derived as the proportion of maternal deaths per 1,00,000 live births reported under the SRS. Besides, the 95% Confidence Intervals (95% CI) of the estimates based on the calculated Standard Error (SE) have also been presented. In addition, estimates of Maternal Mortality Rate viz. maternal deaths to women in the ages 15-49 per lakh of women in that age group, and the life time risk have been presented. The life time risk is defined as the probability that at least one women of reproductive age (15-49) will die due to child birth or puerperium assuming that chance of death is uniformly distributed across the entire reproductive span (Special Bulletin on MMR, June 2011)

High prevalence of nutritional deficiency and chronic energy deficiency are observed among the ST women indicating nutritional problem being more serious for this category. Micronutrient deficiency is a serious contributor to childhood morbidity and mortality. Vitamin A is an essential micronutrient for the immune system and plays an important role in maintaining the epithelial tissue in the body. NFHS-4 (2015-2016) collected information on the consumption of vitamin A-rich foods and on the administration of vitamin A supplements for the youngest child age 6-35 months living with the mother. ¬Among all social groups, the percentage of ST children were lowest in consuming foods rich in vitamin A in the day or night preceding the survey (43.8 percent). Only 21 percent of ST children age 12-35months received vitamin A supplements in the six months before the survey. This figure drops further, to only 14.6 percent, among children age 6-59 months. Children belonging to STs have the poorest nutritional status on almost every measure and the high prevalence of muscular wasting in this group is of particular concern. -seventy seven percent of children belonged to ST category are anemic, including 26.3 percent who are mildly anemic, 47.2 percent are moderately anemic and above 3.3 percent are severely anemic. ST children top among all social groups, as far as "any anemia" prevailing among them is concerned (NFHS-4, 2015-2016).

The consumption of a wide variety of nutritious foods is important for women's and men's health. NFHS-4 asked women and men how often they consume various types of food (daily, weekly, occasionally, or never). ¬ Women especially young girls from Scheduled Tribes have a relatively poor diet that is particularly deficient in fruits and milk or curd. Women and young girls in households with a low standard of living are less likely than others to eat each type of food listed, and their diet is particularly deficient in fruits and milk or curd. ¬ Milk or curd is consumed weekly by 33.5 percent and 41.8 percent of ST women and young girls respectively. Consumption of fruits is less common among STs. 72.6 percent of women do not consume fruits even once a week. (Status of Health and Family Welfare among Scheduled Tribes, 2016).

It is an accepted fact that the most of the rural areas in India suffer from perilous atmosphere and abysmal living conditions. Unsafe and unhygienic birth practices, unclean water, poor nutrition, subhuman habitats, and degraded and unsanitary environments are characteristics of the rural areas, making the rural habitats the first victim of epidemics.

¬In spite of the efforts of the government, these Tribal areas continue to suffer from poor maternal and child health services and ineffective coverage under national health and nutrition programmes. Research and data available through surveys have found that infrastructure like Sub-Centers, Community Health Centers (CHCs), Public Health Centers (PHCs) and others are less than required in the tribal areas (Babu, 2013).

C. Nutrition Programmes and Schemes Initiated in India for the Benefit of Tribal Girls

• **Mid-Day Meal Scheme (MDMS):** The Mid-Day Meal Scheme is a school lunch programme of the Government of India designed to improve the nutritional status of school going children nationwide. The programme supplies free lunch on working days for children in primary and upper primary classes in government, government aided, local body, Education Guarantee Scheme and alternate innovative education centres, Madarsa and Maqtabs supported under SarvaShikshaAbhiyan and National Child Labour Project schools run by the Ministry of Labour, Government of India. Serving 120,000,000 children in over 1,265,000 schools and Education Guarantee Scheme centres, it is the largest such programme in the world.

With a view to enhancing enrolment, retention and attendance and simultaneously improving nutritional levels among children, the National Programme of Nutritional Support to Primary Education (NPNSPE) was launched as a Centrally Sponsored Scheme on 15th August 1995. In 2001 MDMS became a cooked Mid-Day Meal Scheme under which every child in every Government and Government aided primary school was to be served a prepared Mid-Day Meal with a minimum content of 300 calories of energy and 8 to 12 grams of protein per day for a minimum of 200 days. The Scheme was further extended in 2002 to cover not only children studying in Government, Government aided and local body schools, but also children studying in Education Guarantee Scheme (EGS) and Alternative and Innovative Education (AIE) centres. In September 2004, the scheme was revised to provide for Central Assistance for cooking cost at the rate of one rupee per child per school day to cover cost of pulses, vegetables cooking oil, condiments, fuel and wages and remuneration payable to personnel or amount payable to agency responsible for cooking. Transport subsidy was also raised from the earlier maximum of Rs. 50/- per quintal to Rs. 100/- per quintal for special category states and Rs. 75/- per quintal for other states.

In July 2006, the scheme was further revised to enhance the cooking cost to Rs. 1.80/- per child per school day for States in the North Eastern Region and Rs. 1.50/- per child per school day for other States and Union Territories. The nutritional norm was revised to 450 calories and 12 gram of protein. In October 2007, the scheme was extended to cover children of upper primary classes (i.e. class VI to VIII) studying in 3,479 Educationally Backwards Blocks (EBBs) and the name of the scheme was changed from 'National Programme of Nutritional Support to Primary Education' to 'National Programme of Mid-Day Meal in Schools'. The nutritional norm for upper primary stage was fixed at 700 Calories and 20 grams of protein. The scheme was extended to all areas across the country from 1.4.2008. The scheme was further revised in April 2008 to extend the scheme to recognised as well as unrecognized Madarsas / Maqtabs supported under SSA. (Ministry of Human Resource Development, 2016)

The MDMS has many potential benefits: attracting children from disadvantaged sections (especially girls, Dalits and Adivasis) to school, improving regularity, nutritional benefits, socialization benefits and benefits to women are some that have been highlighted. Studies by economists show that some of these benefits have indeed been realised (Sharma et al., 2015).

• **Adolescent Girls Scheme (AG):** Integrated Child Development Services (ICDS), with its opportunities for early childhood development, seeks to reduce both socio-economic and gender inequities. It was felt that several programmes existed for young children in the age group six months to six years (through the ICDS), the young girls in the age group 6-11 years (through the Formal School Education System) and for mothers. But somehow, there was no specific programme catering to vast section of unmarried school dropout adolescent girls in the age group of 11-18 years. For the first time in India, during 1991-92, a special intervention was devised for adolescent girls, using the Integrated Child Development Services (ICDS) infrastructure. This intervention focuses on school dropouts, girls in the age group of 11-18 years, to meet their needs of self-development, nutrition, health, education, literacy and recreational skill formation.

The adolescent girl's scheme was designed to include two subschemes viz. Scheme-I (Girl to Girl Approach) and Scheme-II (Balika Mandal). The Scheme-I was designed for adolescent girls in the age group of 11-15 years belonging to families whose income level is

below Rs. 6,400 per annum. The Scheme-II was intended to reach to all adolescent girls in the age group of 11-18 years irrespective of income levels of the family but with a definite preference in the identification process to girls belonging to poor families (Press Information Bureau, 2000).

The Government of India felt a need to extend the coverage of the scheme for the adolescent girls being implemented at present in 507 blocks in the country benefiting 3.5 lakh adolescent girls through anganwadi centers in both rural and urban settings. Thus, a special intervention programme was devised for adolescent girls using the ICDS infrastructure and with content enrichment - the Kishori Shakti Yojana (KSY) (Press Information Bureau, 2000).

• **Kishori Shakti Yojana (KSY):** This scheme was a redesign of the already existing Adolescent Girls (AG) Scheme being implemented as a component under the Centrally Sponsored Integrated Child Development Services (ICDS) Scheme. This scheme was implemented from 2001. The new scheme dramatically extended the coverage of the earlier scheme with significant content enrichment, strengthens the training component, particularly in skill development, aspects aimed at empowerment and enhanced self-perception. It also fostered convergence with other sectoral programmes, addressing the interrelated needs of adolescent girls and women. The broad objectives of the scheme were to improve the nutritional, health and development status of adolescent girls, promote awareness of health, hygiene, nutrition and family care, link them to opportunities for learning life skills, going back to school, help them gain a better understanding of their social environment and take initiatives to become productive members of the society. Number of blocks covered under KSY were 6118. The target group was adolescent girls in the age group of 11-18 yrs (Ministry of Women and Child Development, n.d.). In 2006-07, KSY was expanded to cover all 6,118 ICDS projects under the 'Nutrition Programme for Adolescent Girls' (NPAG), wherein special attention was given to nutrition requirements of the potential mothers of the future (Government of India, n.d.).

• **Nutrition Programme for Adolescent Girls (NPAG):** To address the problem of under-nutrition among adolescent girls and pregnant women and lactating mothers, the Planning Commission, in the year 2002-03, launched the Nutrition Programme for Adolescent Girls (NPAG), on a Pilot Project basis in 51 districts in India. Under this scheme, six kilograms of

food grains were given to under nourished adolescent girls, pregnant women and lactating mothers. Eligibility was determined on the basis of their weight. The pilot project was continued in the year 2003-04 also. However, it could not be continued in the year 2004-05. The Government of India approved the implementation of NPAG, through the Department of Women and Child Development, in 51 backward districts identified by the Planning Commission of India in the year 2005-06 to provide six kilograms of free food grains to undernourished adolescent girls only (pregnant women and lactating mothers are not covered as these are targeted under ICDS). The scheme continued for the annual plan 2006-2007 on pilot project basis.

The target group of this scheme is adolescent girls in the age group of 11-19 years (weight < 35 Kg). The service provided under this scheme is six kilograms of free food grains (wheat/rice/Maize based on habitual consumption pattern of the state) /per month per beneficiary. The funds were given as 100 per cent grant to States/UTs so that they can provide food grains through the Public Distribution System free of cost to the families of identified undernourished persons (Ministry of Women and Child Development, 2010).

• **Adolescent Girls Anemia Control Programme:** In view of the high rate of prevalence of anaemia, the Government of India and the State Governments with technical support by UNICEF and partners have been implementing for over a decade, the Adolescent Girls Anaemia Control Programme. The main objective of the programme is to reduce the prevalence and severity of anaemia in school-going adolescent girls using schools as the delivery channel and in out-of-school adolescent girls using the community anganwadi centre of India's Integrated Child Development Services (ICDS) programme as the delivery platform. The programme strategy for the initial phase was built around three essential interventions: 1) weekly iron and folic acid supplementation (WIFS) comprising 100 mg of elemental iron and 500 μg of folic acid; 2) bi-annual deforming prophylaxis (400 μg of albendazole) six months apart for the prevention of helminth infestations; and 3) information, counselling and support to adolescent girls on how to improve their diets and how to prevent anaemia. The Initial phase of the programme (2000-2005) was implemented in 52 districts across 13 states. Consolidation phase of the programme (2006-2010): The encouraging results of the initial phase of the programme provided state governments with a solid foundation to scale up the programme using government funds.

Between 2006 and 2010, the programme increased significantly its reach and coverage. By the end of 2010, the programme was being implemented state-wide in 11 states with state funds. The coverage of the programme doubled and the number of adolescent girls benefiting from the programme increased from 8.8 million by the end of 2005 to 14.5 million by the end of 2010.

Expansion phase of programme (2011+): The initial and consolidation phases demonstrated that the programme was effective in reducing the prevalence and severity of anaemia among adolescent girls and that it was possible to scale up its reach and coverage with state government funds; importantly, the programme contributed to put adolescent girls at the centre of policy formulation and programme design.

In 2011, the Government of India launched the Rajiv Gandhi Scheme for the Empowerment of Adolescent Girls, also known as SABLA. By the end of 2011, the Adolescent Girls Anaemia Control Programme was being rolled out state wide in 13 states using schools, anganwadi centres and SABLA as the delivery platforms. The programme was reaching 27.6 million adolescent girls of whom 16.3 million were school-going girls and 11.3 million were out-of-school girls (No Author, "SABLA Scheme" Times of India, 2011).

• Rajiv Gandhi Scheme for Empowerment of Adolescent Girls (RGSEAG) – SABLA: On 5th July, 2010 the 'Sabla' scheme renamed as 'Rajiv Gandhi Scheme for Empowerment of Adolescent Girls (RGSEAG)' was given the clearance for implementation in selected 200 Districts to begin with, (Ministry of Women and Child Development, 2010). In the selected Districts, SABLA replaced the already existing Nutrition Programme for Adolescent Girls (NPAG) and Kishori Shakti Yojana (KSY) (Center for Social Research). SABLA, a scheme for empowerment of adolescent girls, was launched on International Women's Day in the year 2011, includes a complete nutrition programme for adolescent girls in the age group of 11 to 18 years (under all ICDS projects) (No Author, "SABLA Scheme" The Times of India, 2011). The scheme aims at empowering adolescent girls of 11-18 years by improving their nutritional and health status and upgrading various skills like home skills, life skills and vocational skills thus equipping the girls on family welfare, health and hygiene (Press Information Bureau, 2015).

The anganwadicentres are the focal point for the delivery of the services. At the anganwadicentre, supplementary nutrition providing 600 Kcal and 18-20 grams of protein

and micronutrients is provided every day either as hot cooked meal or as take home rations to out of school adolescent girls in 11-14 years and all girls between 14-18 years for 300 days in a year (Press Information Bureau, 2012). The girls are provided with information on existing public services. It also aims at mainstreaming out-of-school girls into formal or non-formal education by establishing convergence with education departments. In Tamil Nadu, adolescent girls in the selected nine districts are provided with Complementary Food containing amylase activity as Supplementary Nutrition under SABLA for 300 days in a year (ICDS, 2012).

Besides such enormous efforts and independent initiatives taken up by the Government and NGOs, till recently adolescent girls' health has not made sufficient improvements. Adolescent girls need an integrated package of services/ facilities, which will enhance their capacity for advancement and enable them to become capable citizens. More important is the integration of functional literacy component to empower the tribal adolescent girls to maintain good health and contribute effectively to a healthy generation.

D. Nutritional and Reproductive Health Knowledge among the Tribal Girls

A study was done by Sharma et al. (2009) to see the awareness of adolescent girls in Himachal Pradesh regarding health aspects through an intervention study. An intervention package was developed on the aspects of health including general health, reproductive and child health, environmental health and nutritional aspects. The intervention was given for nine months to the girls though lectures, discussions and demonstrations. Post testing was done on the girls after the period of intervention. Their results showed that the knowledge of girls regarding health aspects improved significantly after intervention. There was a considerable increase in the awareness levels of girls with regard to knowledge of health problems, environmental health, nutritional awareness and reproductive and child health. Thus informative and educable interventions seem to have a positive effect on awareness levels which would eventually encourage expansion of knowledge, and positive health habits.

Around two-thirds of the mothers of adolescents did not have any nutritional knowledge in socially backward communities of Guntur, Andhra Pradesh (Kumari and Krishna, 2011). In their study, prevalence of overweight and obesity (2.7%, $P < 0.001$) was significantly lower among adolescents who participated in household activities (> 2 h/day)

and was highly significant among those who did not play any indoor games (6.6%, P< 0.001).

A study was conducted by Khalid et al. (2011) to analyze the students' daily intake of balanced diet in female respondents of two Universities in Faisalabad, Pakistan. Almost both of the students of universities knew about balanced diet. They used to take fruit and vegetable salad in the form of 1/2 cup in a day and 3-4 times in a week. Correspondingly, half of the university students either used to eat vegetable like fried potato, chat, vegetable roll, sandwich, burger or fruit juices and fruit shake at lunch time in university. Both university students agreed that inclusion of fruit and vegetable in junk food would convert the food into healthy food which can help to reduce the obesity and used in weight management programs for youth.

Around two-thirds of the mothers of adolescents did not have any nutritional knowledge in socially backward communities of Guntur, Andhra Pradesh (JaljaKumari and Sri Hari Krishna, 2011). In their study, prevalence of overweight and obesity (2.7%, P < 0.001) was significantly lower among adolescents who participated in household activities (> 2 h/day) and was highly significant among those who did not play any indoor games (6.6%, P< 0.001).

Adolescents are the best human resources. But for many years, their health has been neglected because they were considered to be less vulnerable to disease than the young children or the very old. Their health attracted global attention in the last decade only (Kalhan et al, 2010). The collaborative study done in Hyderabad, New Delhi, Calcutta and Madras showed that amongst girls between 6-14 years of age, the prevalence of anaemia was 63.8%, 65.7%, and 98.7% respectively. A study in rural area showed that 65.5% parents of adolescent girls never spoke about the physical changes during puberty, like menarche, with their daughters.

A study was done by Sharma et al. (2009) to see the awareness of adolescent girls in Himachal Pradesh regarding health aspects through an intervention study. An intervention package was developed on the aspects of health including general health, reproductive and child health, environmental health and nutritional aspects. The intervention was given for nine months to the girls though lectures, discussions and demonstrations. Post testing was

done on the girls after the period of intervention. Their results showed that the knowledge of girls regarding health aspects improved significantly after intervention. There was a considerable increase in the awareness levels of girls with regard to knowledge of health problems, environmental health, nutritional awareness and reproductive and child health. Thus informative and educable interventions seem to have a positive effect on awareness levels which would eventually encourage expansion of knowledge, and positive health habits.

Mudey et al. (2010) conducted a study regarding safe and hygienic practices among rural adolescent girls of Wardha. Majority of the girls received the information regarding menstruation from their mothers (41%), followed by Media (24%) and friends (19%). Of the girls who developed genital tract infections, 66% used cloth. 37% girls do not disclose about their menstruation. Cleanliness of external genitalia was unsatisfactory. Hence it is important to educate the girls with scientific knowledge and dispelling their myths and misconceptions thereby encouraging safe and hygienic practices for safeguarding themselves against various infections.

In a study, Zaman et at (2010) found that seventy two percent of the respondents had average knowledge about puberty. Among the respondents, 47% had average knowledge regarding adolescent reproductive health problems and 77% of respondents had average knowledge about safe motherhood. Regarding the complication of unsafe abortion, 73% had average knowledge and 70% had average knowledge about consequence of early pregnancy. Fifty seven percent of the respondents had good knowledge about Sexually Transmitted Diseases. Sixty one percent of the respondents had good knowledge regarding the high risk behaviour of the adolescents. Significant statistical association was found between knowledge and education, knowledge and occupation, and knowledge and source of information of reproductive health ($p<0.05$).

In a study, Madeni et al. (2011) used a quasi-experimental pre-test and post-test research design to evaluate adolescents' knowledge, attitude, and behavior about reproductive health before and after the program. The girls mean score in the knowledge pre-test was 5.9, and 6.8 in post-test, which increased significantly ($t=7.9$, $p=0.000$). The mean behavior pre-test score was 25.8 and post-test was 26.6, which showed a significant increase ($t=3.0$, $p=0.003$). The boys' mean score in the knowledge pre-test was 6.4 and 7.0 for the

post-test, which increased significantly (t=4.5, p=0.000). The mean behavior pre-test score was 25.6 and 26.4 in post-test, which showed a significant increase (t=2.4, p=0.019).

E. Importance of KAP and Effect of Nutritional Interventions on Nutritional Knowledge and Health Status of Tribal Young Girls

a. Importance of KAP Survey

There is increasing recognition within the international aid community that improving the health of poor people across the world depends upon adequate understanding of the socio-cultural and economic aspects of the context in which public health programmes are implemented. Such information has typically been gathered through various types of cross-sectional surveys, the most popular and widely used being the knowledge, attitude, and practice (KAP) survey, also called the knowledge, attitude, behaviour and practice (KABP) survey (Green 2011, Nichter 1993).

In KAP surveys, the knowledge part is normally used only to assess the extent of community knowledge about public health concepts related to national and international public health programmes. Investigation of other types of knowledge, such as culture-specific knowledge of illness notions and explanatory models, or knowledge related to health systems, e.g. access, referral, and quality, is highly neglected (Hausmann-Muela et al. 2003).

An integral part of KAP surveys is the investigation of health-related practices. Questions normally concern the use of different treatment and prevention options and are hypothetical. KAP surveys have been criticized for providing only descriptive data which fails to explain why and when certain treatment prevention and practices are chosen. In other words, the surveys fail to explain the logic behind people's behaviour (Hausmann-Muela et al. 2003 and Nichter 1993). Another concern is that KAP survey data is often used to plan activities aimed at changing behaviour, based on the false assumption that there is a direct relationship between knowledge and behaviour. Several studies have, however, shown that knowledge is only one factor influencing treatment-seeking practices, and in order to change behaviour, health programmes need to address multiple factors ranging from socio-cultural to environmental, economical, and structural factors, etc. (Launiala and Honkasalo 2007).

Within public health programme research there has been an increasing trend towards multiple-method designs composed of a variety of qualitative and quantitative methods, in order to lessen the limitations of single method designs (Lambert and McKevitt 2002). The

use of a multiple-method design allows contextualization of knowledge and makes it possible to understand the logic behind treatment-seeking practices. One of the advantages of combining qualitative and quantitative methods is that it increases the validity of data if the study is appropriately designed. One should, however, keep in mind that any successful research outcome depends heavily on the skills of the researcher.

A KAP survey can be useful when the research plan is to obtain general information about public health knowledge regarding treatment and prevention practices, or about sociological variables, such as income, education, occupation, and social status. It is important, however, to know and understand what type of data can be generated by which method, and to choose appropriate methods in relation to the study objectives. If the objective is to study health-seeking knowledge, attitudes, and practices in context, there are suitable ethnographic methods available, including focus group discussions, in-depth interviews, participant observation, and various participatory methods. A combination of qualitative and quantitative methods may also prove effective, but I believe that the best value can be achieved only when the research team consists of experts from both qualitative and quantitative research traditions. Anthropologists working in international and public health should strive to find ways to enhance true interdisciplinarity (Napolitano and Jone. 2016).

b. Effect of Nutritional Interventions on Nutritional Knowledge and Health Status of Tribal Young Girls

Tribal population constitutes about 8% of the total population in India. They are particularly vulnerable to undernutrition, because of their geographical isolation, socio-economic disadvantage and inadequate health facilities. Recognizing the problem, Government of India launched different programmes for their welfare. Adolescence is a significant period of growth and maturation. Nutrition interventions are planned actions that introduce new goods and services into the existing food system for the explicit purpose of improving the nutritional well-being of designated groups. The potential effectiveness of nutrition interventions can best be realized if they are planned and designed within a larger conceptual framework. Although individual nutrition interventions can be and have been mounted as separate activities, nutrition intervention has been most successful where it was viewed as an integral part of a country's overall development efforts aimed at improving the well-being and productive potential of the poorer groups (Sinha and Sharma, 2013).

Rose-Clarke et al (2019) has identified key areas of focus to improve health, nutrition and wellbeing among tribal adolescent girls living in eastern India: reducing violence, early marriage and undernutrition, as well as improving mental health, knowledge about contraception and retention of girls in school. Whilst national government programmes to improve adolescent health broadly cover the main health issues in this population, local assessment of priorities and adaptation of programme content are necessary to ensure programmes are relevant and effective.

Nutrition education is defined as "any set of learning experiences designed to know about the essentials of nutrition, to facilitate the voluntary adoption of eating and to take steps to improve the quality of their diets, thus their well-being and have a healthy life (Seibel, 2012). It has the potential to play an important role in ensuring food security and improving nutritional status of an individual and community (Ingram et al., 2013).

Nutrition education is the behaviour approach and systematic influence exerted by a mature person upon the immature, through instruction or supporting the harmonious development of physical, intellectual, aesthetic, social and other abilities of human beings by providing appropriate stimulation and environment (Escamilla et al., 2008). Nutrition education is the process by which beliefs, attitudes, environmental influences and understanding about the food lead to practices that are scientifically sound, practical and consistent with individual needs and available food resources. Nutrition education about personal food and health practices will lead to eat the kinds and amounts of foods that will make a maximum contribution to health and social satisfaction. Health education is the process that bridges the gap between health information and health practices (Sajjan et al., 2015).

Among the existing health and nutrition programmes, the education component is known to be weakest link. Hence, it is essential that all the health personnel are armed with necessary information regarding every health and nutrition programme (Chen et al., 2013). Economic independence, leadership qualities and skills to change and adapt to technologies along with education is vital for the development of women in nation (Umezinwa and Chigbata, 2013). Nutrition education is the vital aspect of health care. For delivering health and nutrition messages any modern media as well as traditional media like radio, television,

folk song, drama, puppetry and storytelling and printed materials like handouts, booklets, posters and pamphlets can be used (Pattanaik, 2004).

The studies by Kaur et al. (2007) indicated that the mean score on nutrition knowledge has been increased significantly ($P \leq 0.01$) from 11.17±1.42 to 19.6±1.8 among the 60 adolescent girls in the age group of 13-19 years after the nutrition education. The nutrition education also significantly raised the mean nutrient intake of carbohydrate, protein, fat, vitamins and minerals.

Dietary modification involves increased iron intake, by increasing total food intake and consumption of locally available iron rich food and dietary practices favoring iron absorption. One way to improve the absorption of iron food is to increase the intake of vitamin C. This enhances the absorption of non- haem iron if the two nutrients are consumed within an hour of each other. The efficacy of vitamin C in vitamin C rich foods is the same as that of the synthetic form. However, these are few data on the feasibility, and effect on iron status, of increasing intake of vitamin C from locally available foods (Laura et al., 2014).

According to the study conducted by Chatterjee et al (2019) programmes for WASH (Water sanitation and hygiene) need to be strengthened, especially in low resource settings. Realization of rights of poor and marginalized people for sufficient clean water also requires utmost attention. Through the National Rural Health Mission (NRHM), the government of India has been trying to reach out to women/girls with low cost branded sanitary napkins. Ministry of Women and Child Development (MoWCD) is also running SABLA programme to improve their nutrition, health status and health knowledge that includes awareness about health, hygiene, nutrition. Demand generation through community mobilization and system strengthening for efficient supply of water, sanitation, hygienic products, and awareness generation are to be realized as a sustainable solution to reduce the burden of undernutrition among adolescent girls.