
REVIEW OF LITERATURE

The literature pertaining to the study on **Prevalence of Micronutrient Deficiencies among Self Help Group Women and the Impact of Interventions** is reviewed under the following headings:

A. Micronutrient Deficiencies and their Significance

1. Role of Micronutrients in Women's Health
2. Prevalence of Micronutrient Deficiencies

B. Strategies to Overcome Micronutrient Deficiencies

1. Dietary Improvement
2. Food Based Approaches
3. Nutrition Education
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C. Self Help Groups, Women's Health and Empowerment

1. Empowerment of Women through Self Help Groups
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A. Micronutrient Deficiencies and their Significance

1. Role of Micronutrients in Women's Health

Micronutrient deficiencies (MNDs) have direct effects on individuals and indirect effects on societies (Bailey, 2015). Micronutrient deficiencies (MND) such as Vitamin A Deficiency (VAD), Iron Deficiency Anemia (IDA) and Iodine Deficiency Disorders (IDD) are major nutritional problems in the developing countries, adversely affecting the people's health, performance, productivity and income, thereby becoming a major impediment to economic development (Bowley, 2008).

Micronutrients not only benefit women's health during childbearing years and during pregnancy and lactation, but they also have substantial impact on women's health during adolescence and the aging years (Bartley *et al.*, 2005).

Micronutrients have a substantial impact on a woman's health throughout her entire life. Every woman needs a constant, balanced and adequate supply of all essential nutrients throughout her lifetime. Research suggests that several micronutrients play key roles in women's health, including iodine, B vitamins, vitamin D, calcium and vitamin C (www.vitalah.com/.../EDU_WomensHealth-0907).

Micronutrients specific to women's health are related in some way to reproduction: supporting menstruation, reducing risk of negative pregnancy outcome, and achieving maximum skeletal density when young as a protection against morbidity with advancing age (Glanville, 2012).

According to Micronutrient Initiative (2015) women of child-bearing age are one of the groups most at risk of micronutrient deficiencies, which may stop them from fulfilling these many roles in the way that they want to. When adolescent girls are undernourished, they become women and mothers who are under-nourished, and as a result their children don't get the right start in life. These are the children who are most likely to perish or face consequences, including mental and physical impairments that last a life time.

In poor households, women play a critical role in ameliorating the effects of poverty, especially for infants and young children. Clearly, the reduction of micronutrient deficiencies has an impact on infant and child mortality; maternal morbidity and mortality and development. Growth and economic and social well-being, needs to be aggressively tackled, not least to reflect the legal human right of women and children to adequate nutrition, including micronutrients (Hill *et al.*, 2005).

Around the world, billions of people live with vitamin and mineral deficiencies. For instance, approximately one third of the developing world's children under the age of five are vitamin A deficient, and therefore ill-equipped for survival. Iron deficiency anaemia during pregnancy is associated with 115,000 deaths each year, accounting for one fifth of total maternal deaths (ICCIDD, 2009).

Anemia resulting from iron deficiency or other causes reduces a woman's ability to survive bleeding during and after childbirth and may result in premature and/or low birth weight babies with a higher risk of death. Iodine deficiency during pregnancy can cause stillbirths, spontaneous abortions, low birth weight, and congenital abnormalities such as cretinism and goiter (enlarged thyroid). The risk of neural tube defects is significantly reduced if a woman increases her folic acid intake through either fortification or supplementation prior to and during early pregnancy (<http://www.a2zproject.org/node/6>).

In the milder form, anaemia is "silent", without symptoms. In the more severe form, anaemia is associated with fatigue, weakness, dizziness and drowsiness. The signs include loss of normal colour in the skin (in fair skinned people) and also in the lips, tongue, nail beds and the blood vessels in the white of the eye. Without treatment, anaemia can worsen and become an underlying cause of chronic ill health, such as impaired fetal development during pregnancy, delayed cognitive development and increased risk of infection in young children, and reduced physical capacity in all people (WHO, 2001).

Anaemia is the most prevalent nutritional deficiency disorder in the world. It affects all age groups but the most vulnerable are preschool-age children, pregnant women, and non-pregnant women of childbearing age (Kaur, 2014).

In India, anaemia is the second most common cause of maternal deaths. Apart from the risk to the mother it is also responsible for increased incidence of premature births, low birth weight babies and perinatal mortality (Gautham *et al.*, 2004)

Vitamin A deficiency can cause blindness, impair health and be an underlying cause of death, in young children (West *et al.*, 2010). Vitamin A deficiency (VAD) is the leading cause of preventable blindness in children and increases the risk of disease and death from severe infections. In pregnant women VAD causes night blindness and may increase the risk of maternal mortality (WHO, 2015).

Although the health consequences of VAD are not well delineated beyond early childhood, recent data indicate that VAD in women of reproductive age may increase morbidity and mortality during pregnancy and the early postpartum period (Christian *et al.*, 2000).

Iodine Deficiency Disorder constitute the single largest cause of preventable brain damage worldwide leading to learning disabilities and psychomotor impairment (WHO, 2007).

Adequate dietary iodine is an important determinant of cognitive ability in humans (Zimmermann, 2009). Iodine is one of the most important elements required by a developing fetus because of its effect on brain development. In areas of severe iodine deficiency, poor thyroid status during pregnancy can cause cretinism and adversely affect cognitive development in children; to prevent fetal damage, iodine should be given before or early in pregnancy (ICCIDD, 2009).

When iodine requirements are not met, the thyroid may no longer be able to synthesize sufficient amounts of thyroid hormone. The resulting low-level of thyroid hormones in the blood is the principal factor responsible for the series of functional and developmental abnormalities, collectively referred to as IDD. Iodine deficiency is a significant cause of mental developmental problems in children, including implications on reproductive functions and lowering of IQ levels in school-aged children. The consequence of iodine deficiency during pregnancy is impaired synthesis of thyroid hormones by the mother and the foetus (Kapil, 2007).

Insufficient intakes of calcium do not produce obvious symptoms in the short term because the body maintains calcium levels in the blood by taking it from bone. Over the long term, intakes of calcium below recommended levels have health consequences, such as causing low bone mass (osteopenia) and increasing the risks of osteoporosis and bone fractures. Symptoms of serious calcium deficiency include numbness and tingling in the fingers, convulsions, and abnormal heart rhythms that can lead to death if not corrected (National Institute of Health, 2013).

The clinical implications of calcium deficiency include rickets, poor bone mass accrual as well as abnormal foetal programming during pregnancy, poor

peak bone mass due to poor accrual in childhood and adolescence, postmenopausal osteoporosis and osteoporosis of the elderly (Bhatia, 2008).

Fractures due to osteoporosis have a serious impact on a person's health, happiness and quality of life. They can result in chronic pain, long-term disability and death. We cannot afford to ignore the problem. At least one in three women and one in five men over the age of fifty around the world will suffer an osteoporotic fracture (International Osteoporosis Foundation, 2015).

2. Prevalence of Micronutrient Deficiencies

Micronutrients 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 (WHO, 2015).

According to UNICEF (2009) micronutrients are essential to a good start in life and robust growth and development. In particular, vitamin A, iodine, iron, zinc and folate play pivotal roles in maintaining healthy and productive populations.

Micronutrient deficiencies rank among the top twenty risk factors for morbidity and impaired quality of life worldwide, with particular burdens falling on populations in poor countries, on children, and in the case of iron deficiency, on women of childbearing age (Lopez *et al.*, 2006).

Iron deficiency is the most common MND in the world, affecting more than 30 per cent of the world's population, an estimated 2 billion people (WHO,2008). The level of anaemia which is due to inadequacy of iron continues to be high and there has been very little improvement over time (Singh, 2007).

The anaemia prevalence levels are more than two times higher among women than men with almost half of them with moderate to severe anaemia. The prevalence of anaemia is marginally higher in rural than urban areas but anaemia is a common problem in both urban and rural areas. More than 50 percent of women in urban areas are anaemic, with almost one third of them with moderate to severe anaemia (Anil, 2007).

On an average, globally, 50 per cent of anaemia is assumed to be attributable to iron deficiency. Globally, iron deficiency ranks number 9 among 26 risk factors included in the GBD 2000, and accounts for 841,000 deaths and 35,057,000 disability-adjusted life years lost (Stoltzfus, 2003).

WHO estimates that in 2004, iron deficiency anemia (IDA) resulted in 273,000 deaths: 45 per cent in Southeast Asia, 31 per cent in Africa, 9 per cent in the Eastern Mediterranean, 7 per cent in America, 4 per cent in the Western Pacific, and 3 per cent in Europe, with 97 per cent occurring in low- and middle-income countries. It also caused the loss of 19.7 million disability-adjusted life years, accounting for 1.3 per cent of the global total. Of these lost disability-adjusted life years, 40 per cent were in Southeast Asia, 25 per cent in Africa, and 17 per cent in the Western Pacific; 97 per cent were lost in low- and middle-income countries (Mathers *et al.*, 2009).

It is estimated that about 20 – 40 per cent of maternal deaths in India are due to anaemia and one in every two Indian women (56%) suffers from some form of anaemia (NFHS-3, 2005-2006). More women are affected with anaemia as compared to men (Malhotra *et al.*, 2004).

The high prevalence of iron deficiency anaemia among women in childbearing age has important public health implications. It is estimated that anaemia accounts for 12.8 per cent of maternal mortality in Asia (Khan *et al.*, 2006).

It is estimated that nutritional anemia contributes to about 24 per cent of maternal deaths every year and is one of the important causes of low birth weight. It adversely affects work output among adults and learning ability in children (ICMR, 2011).

The global prevalence of anemia is high, and in developing countries about 42 per cent of preschool children, 53 per cent of school-age children, 44 per cent of women of childbearing age, and 56 per cent of pregnant women may be affected by anemia (United Nations, 2000).

A study conducted by Bentley and Griffiths (2003) among the 4032 married women aged 15-49 years from 3872 households showed that the prevalence of anemia was high among all women. In total 32.4 per cent of women had mild anaemia, 14.19 per cent had moderate and 2.2 per cent had severe anemia. In the developing countries alone 370 million women suffer from iron deficiency anaemia (Vijayaraghavan, 2007).

The prevalence of Bitot's spot, the objective sign of clinical VAD (0.8%) was higher than the figures recommended by the WHO (0.5%), indicating the public health significance in rural pre-school children of India (NNMB, 2003). Globally, night blindness affects 5.2 million preschool age children and 9.8 million pregnant women, which corresponds to 0.9 per cent and 7.8 per cent of the population at risk of VAD, respectively (WHO, 2009).

In India the overall prevalence of Bitot's spot, night blindness and conjunctival xerosis among the 1-5 year children was found to be 0.8 per cent, 0.3 per cent and 1.8 per cent respectively (NNMB, 2006). International Institute for Population Sciences, India, confirmed higher prevalence of night blindness among pregnant women, with higher percentage among rural population compared to urban folks (rural 13.7%, urban 6.4%) (NFHS-3, 2005-06).

A study conducted by Rahi *et al.* (2015) showed that in Tamil Nadu, Vitamin A deficiency was responsible for 8 per cent childhood Severe Visual Impairment/blindness in the blind school of the state capital, for 12 per cent in the town of Madurai, and for 30 per cent in the rural area of Palayamkottai.

About 167 million are estimated to be living in IDD endemic areas. About 90,000 still-births and neonatal deaths occur every year due to maternal iodine deficiency. Around 54 million persons are estimated to have goiter, 2.2 million have cretinism and 6.6 million suffer from mild psycho-motor handicaps (ICMR, 2003).

Iodine deficiency disorders are currently a significant health problem in 118 countries. An estimated 1.6 billion People worldwide live in iodine deficient environments and are thus at risk of IDD. Twenty Million of these are believed to

be significantly mentally handicapped due to lack of iodine in food and water (Ministry of Health, 2000).

In India, it is estimated that more than 71 million individuals suffer from IDD, while another 200 million people are at risk for IDD (Ministry of Health and Family Welfare, 2006). The total goiter rate of 13.5 per cent and median urinary iodine excretion of 89.5 µg/L is indicative of iodine deficiency in Tamil Nadu (Pandav *et al.*, 2010). Studies conducted by Amrutha veena and Kowsalya (2012) on prevalence of micronutrient deficiency signs and symptoms among adolescents of Ramanathapuram District showed that the male and female subjects had adequate levels of urinary iodine indicating adequate levels of iodine in the body.

The number of women with osteoporosis, ie, with reduced bone mass and the disruption of bone architecture, is increasing in India. While data on prevalence of osteoporosis among women in India come from studies conducted in small groups spread across the country, estimates suggest that, of the 230 million Indians expected to be over the age of 50 years in 2015, 20 per cent, ie, ~46 million, are women with osteoporosis. Thus, osteoporosis is a major public health problem in Indian women (Malhotra and Mithal, 2008).

In a study among Indian women aged 30–60 years from low-income groups, Bone Mineral Density (BMD) at all skeletal sites was much lower than values reported from developed countries, with a high prevalence of osteopenia (52%) and osteoporosis (29%), thought to be due to inadequate nutrition (Shatrugna *et al.*, 2005).

Around 65 million Indians suffer from osteoporosis and about 23 lakhs are added to this figure each year (Ahuja, 2002). Jain *et al.* (2013) conducted a cross sectional study on 350 women aged 30–65 years and found that Low Bone Mineral Density was found in 51.1 per cent premenopausal and 77.1 per cent postmenopausal women.

B. Strategies to Overcome Micronutrient Deficiencies

There is an urgent need for programmes to alleviate micronutrient deficiencies in developing countries. Strategies commonly used are

supplementation and food-based approaches, preferably in conjunction with public health interventions such as promotion and support of breastfeeding and control of infectious and parasitic diseases (Gibson, 2011).

In order to control the micronutrient deficiencies, the strategies should include a mix of short-term supplementation and food-based strategy encompassing food fortification and home gardening. Innovative approaches in information, education, and communication (such as social marketing strategy) should be adopted for making the interventions sustainable (Vijayaraghavan, 2002). The strategies suggested by Chakravarthy and Ghosh (2000) to control micronutrient deficiencies include Intervention strategies, extensive nutrition and health education, to support the problem specific programmes, to strengthen various state government programmes and strengthen the role of NGOs.

In order to increase the intake of micronutrients, the supply must be available, be it from pharmaceuticals, fortified foods, or natural foods. With pharmaceuticals, the key supply issues are physical access, logistics, and medical gatekeeping (via prescriptions). In the case of fortification, supply is assured first by making sure that the food vehicles for fortification, the level of fortification, and the chemical fortificants are properly selected and second, by making sure that the food industry is actually complying with fortification regulations. Where dietary change is promoted as the solution to micronutrient malnutrition, the availability and price of the foods promoted needs to be reinforced by food policies and agricultural programmes to promote production, processing, and efficient marketing of such foods (<http://www.unsystem.org/scn/archives/scnnews09/ch2.htm>).

1. Dietary Improvement

Changes in food selection patterns and traditional household methods for preparing and processing indigenous foods are some of the household strategies suggested by Gibson (2011).

Nutritious and safe diets, an adequate biological and social environment, and proper nutrition and health care ensure adequate utilization of food in order to promote health and prevent diseases (Shetty, 2011).

Micronutrients such as iron, iodine, vitamin A, are necessary for the healthy development of children. Their absence in the diet cause serious disorders. UNICEF encourages the promotion of community gardens and preparation of nutritionally-adequate complementary foods from locally available products and dietary diversification to alleviate the micronutrient deficiency. Micronutrients such as iron, iodine, vitamin A, are necessary for the healthy development of children. Their absence in the diet causes serious disorders (UNICEF, 2006).

Dietary diversification/modification interventions are probably the most sustainable strategies to address causes of micronutrient deficiency (Berti *et al.*, 2014). Dietary diversification helps in the consumption of dark green leafy vegetables, lentils and vitamin C rich fruits, which are rich in micronutrients and are available but under utilized by the deficient population (Sreedevi, 2015).

Increasing dietary diversity means increasing both the quantity and the range of micronutrient-rich foods consumed. In practice, this requires the implementation of programmes that improve the availability and consumption of, and access to, different types of micronutrient-rich foods (such as animal products, fruits and vegetables) in adequate quantities, especially among those who at risk for, or vulnerable to, Micro Nutrient Malnutrition (<http://www.who.int/nutrition/en>).

The low-cost, stable, readily crushable and water-dispersible micronutrient rich supplements developed can be mixed with food or chewed directly. Vitamin and mineral mix packaged in small sachets containing a daily dose of micronutrients called as sprinkles were designed to be mixed with food. Sprinkles containing iron, vitamin A, zinc, and vitamin C (as an absorption enhancer rather than for nutritional purposes) have been shown to be efficacious in treating anaemia in Ghana. Spreads prepared by mixing dry powdered ingredients (i.e.,dried milk products, precooked soy flour, sugars, maltodextrin, minerals, and vitamins) with a vegetable fat such as peanut butter are used as a therapeutic feeding in severely undernourished children (Nestel *et al.*,2015).

Deficiencies occur when people do not have access to micronutrient-rich foods such as fruit, vegetables, animal products and fortified foods, usually because they are too expensive to buy or are locally unavailable (WHO,2007)

Diet that lacks essential nutrients is the usual cause of nutritional deficiencies (<http://www.healthline.com/health/malnutrition#Causes3>). Calton, (2010) emphasized that an individual following a popular diet plan using food alone, has a high likelihood of becoming micronutrient deficient, a condition shown to be scientifically linked to a higher risk of dangerous and debilitating diseases including cancer, osteoporosis, heart disease, birth defects and overweight/obesity. Based on the study's findings, the belief that a healthy, balanced diet can consistently deliver, to a typical dieter, all of the essential vitamins and minerals they need, through whole food alone, is in dire need of revision.

Micronutrient deficiency has a complex aetiology. Besides poor diet due to poverty, ignorance, low agricultural productivity, and cultural factors in addition inadequate access to safe drinking water, clean disease-free environment, and health- care outreach also contribute (INSA, 2011). Low levels of absorption enhancers in the diet are one of the reasons for iron deficiency. Hence dietary consumption of iron along with ascorbic acid could be increased by encouraging the production, processing, marketing and consumption of foods rich in these nutrients (Sharma, 2003).

Dietary modification associated with adequate hygiene behaviors could be a relevant strategy to control iron deficiency and anaemia in areas where infection is a major health problem (Sanou *et al.*, 2010).

A balanced and diverse diet is of importance in maintaining the body's capacity to absorb pro-vitamin A and convert it to vitamin A (Brown *et al.*, 2004).

Alternative strategies that frequently supply small but effective amounts of vitamin A [e.g., one third of the Recommended Daily Intake (RDI)] over a prolonged time would be helpful. A diverse diet, which includes foods of animal origin that are rich in preformed vitamin A (esters of retinol), might be sufficient to satisfy the daily requirements of vitamin A (Dary and Mora, 2002).

At a population level, Iodine Deficiency Disorder (IDD) can be prevented by the iodization of food products or the water supply. In practice, this is usually achieved by iodization of salt (<http://emedicine.medscape.com/article/122714-treatment>).

Many methods of iodization have been used to increase iodine intake. These include the addition of iodine as iodide or iodate to various foods such as bread, water and milk. The addition of iodide to sweets has been used in Mexico. Salt iodization, however, is by far the most widely used and simplest method available. On the assumption of an intake of 5 g. of salt per day an iodization level of 10 mg/kg (10 ppm) would provide 50 mcg of iodine per day. If the salt intake is lower than this, as it is often in populations in some developing countries, a higher level of iodine supplementation is required. In general an iodine intake level of 100 mcg per day can be regarded as adequate for the prevention of goitre and cretinism. There is still the problem of getting the iodized salt to the iodine-deficient subject, however. It may be difficult to preserve the iodine content - the salt may be left uncovered or exposed to heat; for instance, iodized salt should be added after cooking to reduce the loss of iodine (<http://www.unsystem.org/SCN/archives/npp03/ch09.htm>).

If we don't get enough calcium in our diet, our body will take calcium from our bones to ensure normal cell function, which can lead to weakened bones or osteoporosis. The first and best way to prevent osteoporosis is through the foods we eat or the supplements we take (<http://www.helpguide.org/articles/healthy-eating/calcium-and-your-bones.htm>).

Adequate intake of fruits and vegetables may lead to less bone resorption, and a poor dietary pattern of including processed food is associated with a decrease in Bone Mineral Density (Gass and Dawson, 2006).

Multivitamin supplements offer no health protection, increase all-cause mortality, and risk of cancers in some subgroups. A nutritionally balanced diet is a safer way to achieve micronutrient sufficiency (Combet and Buckton, 2015).

2. Food Based Approaches

Food-based solutions for dealing with micro nutrient deficiencies are set forth as a potentially sustainable, affordable, effective, and feasible approach to addressing macro- and micronutrient malnutrition (Charlotte and Neumann, 2007).

Food based strategies may provide the only sustainable approach at the community level to improve the intake of iron and vitamin A through culturally acceptable changes in dietary intakes (www.cgiar.org/ifpri/divs/fcnd/dp.htm) .

Food based approaches in controlling micronutrient deficiencies focus on food in the natural form, processed foods, fortified foods or in the combination of fortified and processed foods as the primary tool in improving the diet quality and preventing the micronutrient deficiency (Chaudhary *et al.*, 2011).

World Health Organization advocate a minimum daily intake of 400 g of fruit and vegetables per adult person for the promotion of good health and prevention of several micronutrient deficiencies (WHO, 2004)

Thomson and Amoroso (2011) stated that increasing the availability and consumption of a nutritionally adequate diet is the only sustainable and long-term solution to overcome micronutrient deficiencies.

Food fortification refers to the addition of micronutrients to processed foods. In many situations, this strategy can lead to relatively rapid improvements in the micronutrient status (NRHM, 2013).

Food fortification can also be a potentially cost effective public health intervention and target a larger population through a single strategy. Fortification programs take different forms: mass fortification involves fortifying foods that are widely consumed by the general population and targeted fortification involves fortifying a food eaten by a specific subgroup of the population that has a particular need. Fortification has shown functional impacts by significantly increasing serum micronutrient concentrations among children (Zulfiqar *et al.*, 2013).

Food fortification is one of the most popular and effective nutritional interventions for improving the dietary nutrients in humans. If made affordable, fortified nutritious food can reach a greater proportion of the population at risk than any other market interventions and promote overall health (FAO, 1996).

Howson *et al.*(1998) emphasized that supplementation, fortification, food based approaches and communication strategies are some of the powerful options for improving the micronutrient status in a population over varying periods of time.

Iron is available in plenty in green leafy vegetables. But the absorption of iron is limited. Vitamin C rich foods must be consumed daily to improve iron absorption. Vitamin A also has a role in maintaining resistance of the body to common infections. Carotenoids are plentiful in fruits and vegetables that are green or deep yellow/orange in colour, such as green leafy vegetables, carrots, tomatoes, sweet potatoes, papaya, mango etc. Vitamin C is an essential nutrient required for healthy bones and teeth. It also promotes iron absorption. Vitamin C is abundantly available in fresh amla, citrus fruits, guava, banana and certain vegetables such as tomatoes (ICMR, 2011).

Green leafy vegetables are rich in micronutrients and could be used to prepare nutritious mixes to enhance their nutrient content (Kowsalya and Indra, 2010). Green leafy vegetables were extremely rich source of nutrients, especially micronutrients and contribute meaningfully to the dietaries of rural populations (Kala and Prakash, 2004).

Among the green leafy vegetables drumstick leaves, agathi, amaranth, curry leaves and coriander leaves contain very high amount of beta carotene (6000-9000 mcg/100g) (Reddy, 1999).

Vegetables and fruits, which are among the perishable commodities, are important ingredients in human dietaries. Due to their high nutritive value, they make significant nutritional contribution to human well-being. They can be supplied in fresh or preserved form throughout the year for human consumption (Srivastava and Kumar, 2002).

Supplementation of recipes incorporated with cauliflower leaves providing 15g of iron for anaemic adolescent girls for 100 days showed that, the mean haemoglobin levels were increased from 10.6g/dl to 13.56g/dl. (Mohankumar and Bhavani, 2004).

Blanched dehydrated amaranthus leaves retained better iron (56.21%) compared to unblanched leaves which had only 33.84 per cent of iron (Rajeswari *et al.*, 2013).

Dehydrated green leafy vegetables can be easily incorporated in different recipes and also used throughout the year (Gupta and Prakash, 2011). Drying of drumstick leaves retained 50 per cent of their beta carotene on shade drying (Nambiar *et al.*, 2003). Dehydration of green leafy vegetables is the simplest convenient technology for preserving micronutrients. Dehydrated green leafy vegetables are the concentrated natural source of micronutrients and they can be used in product formulations. Value addition of traditional products with dehydrated green leafy vegetables can be advocated as a feasible food-based approach to combat micronutrient malnutrition (Gupta *et al.*, 2013)..

Nutrient content of dehydrated green leafy vegetables are equivalent to legumes and dehydrated leaves are the concentrated source of vitamins and minerals. The calcium content of fresh drumstick leaves was 440mg/100g and on shade drying it was increased to 3405mg/100g (Joshi and Mehta, 2010).

Green Leafy vegetables are the low cost locally available foods and rich in beta carotene and iron (Khan *et al.*, 2012). The micro-nutrient content of drumstick leaves was more in dried leaves; (ten times the vitamin A of carrots), (17 times the calcium of milk), (15 times the potassium of bananas), (25 times the iron of spinach) and (nine times the protein of yogurt) (Manzoor *et al.*, 2007).

One rounded tablespoon (8g) of drumstick leaf powder will satisfy about 14 per cent of the protein, 40 per cent of the calcium, 23 per cent of the iron and nearly all the vitamin A needs for a child aged 1-3. Six rounded spoonful of leaf powder will satisfy nearly all of a woman's daily iron and calcium needs during pregnancy and breast-feeding (Mishra *et al.*, 2012).

Drumstick leaves are a rich source of calcium, iron and vitamin A and C and it is also a food based strategy for alleviating micronutrient deficiencies (Singh and Banu, 2014).

Consumption of Moringa Oleifera leaves , and pods and leaf powder are rich source of vitamin A and can prevent night blindness and eye problems in children. Consumption of drumstick leaves with oils can improve vitamin A nutrition and can delay the development of cataract (Pullakhandam and Failla, 2007).

Moringa leaves may be useful in preventing diabetes induced retinal dysfunction (Kumar *et al.*, 2013). The haemoglobin levels of the women in reproductive age group showed a significant improvement in post intervention with Moringa oleifera and jaggery. This may be promoted in the community as a prophylactic and a dietary supplementation in anaemic women (Sindhu *et al.*, 2013).

Amarnath leaves contain dietary fibre, folic acid and perhaps other bioactive nutrients such as bioflavonoids. Further, amaranth leaves contain magnesium, an antimutagen and chlorophyllin, a proven efficient antimutagen and antioxidants (Anilakumar *et al.*, 2006).

A study conducted by Nawiri *et al.* (2013), showed that the dehydration process of amaranth and cow peas retained the beta carotene levels at over 60 per cent.

Ensuring the intake of green leafy vegetables or other vitamin A rich foods in the diets of pregnant women and infants from the age of six months is the most logical way of combating vitamin A deficiency (NNMB, 2000).

Food based strategies such as food fortification and dietary diversification are more effective than micronutrient supplementation which should only be used as a short term measure. Supplementation programmes should be evidence based, multi-nutrient in approach and backed up with other complementary public health interventions(Dairo and Ige, 2009).

Fruits are efficient source of vitamin C, an average of 100g of mixed fruit can be given to an adult to meet his daily vitamin C requirements. The yellow and deep orange coloured fruits are excellent source of beta carotene, the precursor of vitamin A, which protects the person from nutritional blindness (Gopalan and Mohanram, 2004).

Milletts have a potential to assume significance not only for food security but also for nutritional security in India as they are rich in micronutrients like minerals and B-complex vitamins (Konapur *et al.*, 2014).

Finger millet flour upto 40 per cent can be incorporated for the successful improvement of nutritional and organoleptic characters. The use of finger millet flour also enhances the dietary fiber and mineral contents especially iron and calcium(Saikrishna *et al.*, 2011).

The iron content of nutritious mix incorporated with amaranthus was 7.81 mg/100g and it did not possess any food borne illness causing bacterial species like Salmonella sp, Vibrio sp, Campylobacter sp, E.coli and Aeromonas sp. The developed mix was economically feasible to all categories of people (Kowsalya and Indra, 2010).

Antioxidant rich food mixes with drumstick leaves powder, carrot powder and mango powder along with wheat flour, wheat germ, roasted Bengal gram flour, soya flour and amla powder were found to be acceptable and rich in nutrient content especially micronutrients and antioxidants (Kowsalya and Helen, 2006).

According to Sangeetha and Premakumari (2010) supplementation of micronutrients either in the food or in the tablet form resulted in significant improvement in the height, weight, lowering of morbidity and biochemical status among the children. Food based approach will serve as an effective strategy to combat multiple micronutrient deficiencies, promote health and well-being of the children and ensure global nutrition security.

Major *et al.* (2009) found that consumers of dietary vitamin–mineral supplements, after proper adjustments for confounding factors, were leaner and had lower body fat than non-consumers. Micronutrient supplementation is important in body weight regulations (Astrup and Bugel, 2010).

Women who had consumed higher quantities of milk regularly during their young adulthood are less prone to developing osteoporosis in menopausal age, as compared to those who have consumed lesser quantities (Chopra *et al.*, 2012).

Multiple Micronutrient Powders such as ‘Sprinkles’, are single-serve sachets of mixed vitamins and minerals in powder form, which can be instantly sprinkled onto prepared ready-to-eat complementary foods for young children without

changing the color or taste of the food. The single dose sachets are packed to ensure that the correct amounts of micronutrients are given. Micro Nutrient Powders are designed to prevent and control micronutrient deficiencies among young children aged between 6 and 24 months of age and have also been used to reduce anaemia among older children and pregnant women (Ho and McLean, 2011).

Suchdev *et al.* (2012) conducted a study to evaluate the effect of community-based marketing and distribution of Sprinkles Micro Nutrient Powder (MNP) on childhood prevalence rates of anemia and iron and vitamin A deficiency. Findings revealed that even with relatively low and infrequent use, Sprinkles MNP sales through community vendors were associated with decreased rates of anemia and iron and vitamin A deficiency in children in a resource-poor setting.

The solution to control and prevent micronutrient deficiencies at national level are fortifying commonly eaten foods with the missing micronutrients and providing nutrient supplements through targeted distribution programmes (Sankar, 2004).

3. Nutrition Education

Due to inadequate nutritional awareness and knowledge, especially macro and micronutrient deficiencies such as protein energy malnutrition and iron deficiency anaemia are the major nutritional problems mainly found in underdeveloped and developing countries (Kasturiba *et al.*, 2007).

To bring about healthy life, it is necessary to have sufficient and nutritive diet, but this is possible only when people become aware of locally available foods (Chaudhary *et al.*, 2011).

Nutrition education is a mere dissemination of information to persuade target groups to change food beliefs, attitudes, and habits. The participants of the nutrition education programme should freely exchange knowledge, values, and practices on nutrition, food, and related areas. This view of nutrition education as a mechanism for interaction, ensures the active involvement of those who could and

should take part in decision making, and in motivating and providing users with easy access to nutrition-related information, resources, and services (<http://www.fao.org/docrep/w3733e/w3733e04.htm>).

Nutrition education should be geared towards establishing existing levels of nutrition knowledge, attitudes and practices. This should primarily target women, as they are the ones who mostly make the important decision of what to be eaten at every mealtime in their households (Hongo, 2003).

Lack of knowledge of the dietary requirements and the nutritive value of different foods are the main contributory cause for the widespread occurrence of malnutrition among preschool children and other vulnerable sections of the population in the developing countries. Nutrition education should be practical and adopted to suit the socio-economic conditions, food habits and local resources (Swaminathan, 2009).

Dobhal and Raghuvanshi (2011) conducted a study on “Nutrition and Health Status of Urban and Rural Women of Garhwal Region” showed that the nutritional knowledge of the rural women was found to be in the low knowledge category and there is a need to impart education to the women for maintaining traditional food pattern, which can help in preventing nutritional diseases.

A study conducted by Premakumari *et al.* (2012) among the consumers about street foods/foods from small scale food establishments and to assess KAP towards food safety and to observe the safety and hygienic practices adopted, revealed that majority of the consumers knew that the source of contamination of food included air, water, raw food stuff and food handler and also that mould growth is the generally seen sign of spoilage in food. The consumers (86%) were not aware of PFA and they were not aware of the precautions to be taken to prevent an outbreak of food poisoning.

Gowri and Vasantha Devi (2011) conducted a study to assess the knowledge on nutrition and food hygiene practices, identifying the degree of adulteration and microbial contamination of the selected food items prepared by

the Self Help Group members and to assess the impact of education on knowledge gain on food safety. The findings showed that the greens like drumstick and araikeerai leaves were included in their food preparations. The food materials used for recipe preparation were found to be adulterated and contaminated with bacteria and fungi. The impact of food safety education improved their knowledge on safe food handling practices and personal hygiene.

A study to assess the effect of nutrition education on KAP of pregnant women revealed that after the nutrition education more than 90 per cent of the women could answer regarding balanced diet, foods for growth, protective nutrients and all the women could identify those yellow, orange and green vegetables and fruits are rich source of beta carotene and iron. Attitudinal changes like importance of vitamin A nutrition in pregnancy and lactation, significance of vitamin A rich foods and importance of breast feeding. Hence nutrition education was considered to be an important and suitable strategy to combat malnutrition, particularly that of vitamin A (Sylviasubapriya and Usha Chandrasekhar , 2011).

Casal *et al.* (2011) conducted a study with the objective of determining the prevalence of iron, folates and retinol deficiencies among 1301 school children and to evaluate the changes after an intervention of nutritional education. There was high prevalence of iron (25%), folates (75%) and vitamin A (43%) deficiencies in school children, with a low consumption of fruit and vegetables, high consumption of soft drinks and snacks and almost no physical activity. The nutritional education intervention produced a significant reduction in iron deficiency prevalence (25 to 14%).

Softwares can be used as an effective teaching tool with greater retention of knowledge in conveying nutrition messages to the community (Kalpana and Divya, 2004).

4. Government Initiatives

Micronutrient deficiency conditions are a major global public health problem. While the private sector has an important role in addressing this problem, the main

responsibility lies with national governments, in cooperation with international agencies and donors (Tulchinsky, 2015).

Government of India took pioneering steps to formulate national programs to combat macro and micronutrient under nutrition. These programmes have evolved on the basis of research studies in the country, taking into account, the magnitude of the nutritional problems, ecological factors responsible, and feasible interventions that could be implemented within the existing infrastructure (Evaluation of National Nutrition Programmes; 1980-2005, Nutrition Foundation of India).

With the efforts taken by Micronutrient Initiative (MI) in India, Vitamin A syrup is now reaching 65 per cent of children aged 12 to 23 months, zinc and ORS programs in India are being supported through new grants with sustained advocacy efforts by MI, MI India is also providing refresher training for healthcare workers and making efforts to handhold and provide supportive supervision for mothers, caregivers and health care workers, the Iodized Salt Coverage Study 2010 has reported a 20 per cent increase in the use of adequately iodized salt in rural households in Gujarat, Rajasthan, Tamil Nadu, Andhra Pradesh, Orissa and Karnataka (<http://micronutrient.org/mi-in-the-world/asia/india/>).

Girls' iron requirements increase dramatically during adolescent as a result of the expansion of the lean body mass, total blood volume and the onset of menstruation; these changes make adolescent girls more susceptible to anaemia, which has lasting negative consequences for them and for the survival, growth, development of their children later in life. India has nearly 113 million adolescent girls. The prevalence of anaemia in adolescent girls is estimated at 56 per cent. In view of the scale of the problem, the Government of India and 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 (UNICEF, 2011).

In order to reduce the prevalence of anaemia and associated health problems Government of India has initiated programmes for management and control of anaemia. India was the first developing country to take up a National Programme to prevent anaemia among pregnant women and children. The National Anaemia Prophylaxis Programme of iron and folic acid distribution to all pregnant women in India through the primary health care system was evolved and implemented from 1972, so that the vast majority of pregnant women who never seek health care, could benefit from this outreach programme. It was hoped that this programme will bring about a reduction both in the prevalence and severity of anaemia in pregnancy (Kalaivani, 2009).

Applied Nutrition Programme promoted home based production of protective foods such as vegetables and fruits and nutrition education to improve consumption of these by pregnant, nursing mothers and children. Special Nutrition Programme and Tamil Nadu Integrated Nutrition Programme provided supplementary food to children, pregnant and lactating women with a view to improve dietary intake of both cereals and vegetables. The package of services provided through ICDS includes food supplementation to improve protein and energy intake, iron and folic acid distribution to improve haemoglobin status and nutrition and health education to women for improving maternal and child nutritional status. In August 1992, the NGCP was renamed as National Iodine Deficiency Disorders Control Programme (NIDDCP) taking into its ambit control of wide spectrum of IDD like mental and physical handicap, deaf mutism, cretinism, still birth etc. The objectives of the programme were (i) to carry out surveys to assess the magnitude of IDD in the country (ii) produce and supply iodized salt in place of common salt and (iii) to resurvey the area after five years to assess the impact of the iodized salt programme (iv) laboratory monitoring of iodised salt and urinary excretion and (v) health education. The Goal of the NIDDCP is to reduce the prevalence of IDD below 10 per cent in endemic districts of the country. (planningcommission.nic.in/aboutus/committee/strgrp/stgp_nutri.pdf).

The National Iodine Deficiency Disorder Control Programme is implemented in the State from 1991 and the state IDD Cell started functioning from 1.7.1994 onwards. The main objective of the scheme is to promote consumption of iodised salt through various activities like identifying the iodine deficient districts through Goitre surveys, take control measures through dietary supplementation of iodised salt through IEC activities, Spot testing of the Salt samples for the retailers, Spot testing of the kitchen salt samples, testing of Non-Statutory salt samples in Food Analysis Laboratories for the Iodine content in salt, supply of IEC materials to the PHCs, regular review of the programme at District Level by the Deputy Directors and at State level by the Director, celebration of Global IDD prevention day throughout Tamil Nadu involving NGOs, Public and School Children for creating awareness among the community (<http://www.nrhmtn.gov.in/niddcp.html>).

Other schemes of the MWCD, for example SABL A, where supplementary nutrition is provided to adolescent girls (AGs) in the form of take home rations (THR) or hot cooked meals. Under SABL A, each AG will be given at least 600 calories and 18–20 grams of protein and the recommended daily intake of micronutrients, at Rs 5 per day per beneficiary, for 300 days in a year (<http://wcd.nic.in/schemes/sabla.htm>)

Even though supplementation of diet with iron and folic acid (IFA) has been a part of Government of India program for over three decades, NFHS data shows that the levels of IFA intake remain low. For example, less than 20 per cent of women below 20 years took IFA supplements, and only 22 per cent of pregnant women reported consuming IFA for 90 days or more when they were pregnant. Taking cognizance of ground realities discussed above the Ministry of Health and Family Welfare took a policy decision to develop the National Iron+ I initiative. This initiative will bring together existing programmes (IFA supplementation for: pregnant and lactating women and children in the age group of 6–60 months) and introduce new age groups. Thus National Iron+ Initiative will reach the following age groups for supplementation or preventive programming:

- Bi-weekly iron supplementation for preschool children aged 6 months to 5 yrs
- Weekly supplementation for children from 1st to 5th grade in Govt. and Govt. Aided schools
- Weekly supplementation for out of school children (5–10 yrs) at Anganwadi Centres
- Weekly supplementation for adolescents (10–19 yrs)
- Pregnant and lactating women
- Weekly supplementation for women in reproductive age (NRHM, 2013).

Under this, the pregnant and lactating women are given 100mg of elemental iron and 0.5 mg of folic acid and children in the age group 1-5 yrs are given one tablet containing 20mg elemental iron and 0.1 mg of folic acid for a period of 100 days (Sreedevi, 2015).

A12 by 12 initiative was launched in 2007 with the view to ensure that every child had hemoglobin of 12 by 12 yrs. This initiative was jointly undertaken by Ministry of Health and Family Welfare and Federation of Obstetric and Gynaecological Societies of India (FOGSI) (Kishore, 2012).

In view of the fact that more than half of the adolescent girls (56%) suffer from anaemia and the highest prevalence of anaemia is between 12-13 yrs in tandem with the average age of menarche. The Weekly Iron and Folic Acid Supplementation (WIFS) program for adolescents is timely (<http://nrhm.gov.in/nrhm-components/rmnch-a/adolescent-health/weekly-iron-folic-acid-supplementation-wifs/background.html>).

National Programme for Control of Blindness was launched in the year 1976 as a 100 per cent Centrally Sponsored scheme with the goal to reduce the prevalence of blindness from 1.4 per cent to 0.3 per cent. As per Survey in 2001-02, prevalence of blindness is estimated to be 1.1 per cent. Rapid Survey on

Avoidable Blindness conducted under NPCB during 2006-07 showed reduction in the prevalence of blindness from 1.1 per cent (2001-02) to 1 per cent (2006-07). Various activities/initiatives undertaken during the Five Year Plans under NPCB are targeted towards achieving the goal of reducing the prevalence of blindness to 0.3 per cent by the year 2020 (<http://npcb.nic.in/>).

The main objective of the programme is to reduce the prevalence of preventable blindness. Towards this goal, the Tamil Nadu State Blindness Control Society was formed as a separate entity from 1.4.1996, which has been merged with the State Health Society after the implementation of NRHM in the state (<http://www.nrhmtn.gov.in/dbcs.html>).

The important objectives and components of National Iodine Deficiency Disorders Control Programme (NIDDCP) formerly known as National Goitre Control Programme (NGCP) are as follows:-

- Surveys to assess the magnitude of the Iodine Deficiency Disorders.
- Supply of iodated salt in place of common salt.
- Resurvey after every 5 yrs to assess the extent of Iodine Deficiency Disorders and the impact of iodated salt.
- Laboratory monitoring of iodated salt and urinary iodine excretion.
- Health education and Publicity (<http://nrhm.gov.in/nrh-components/national-disease-control-programmes-ndcps/iodine-deficiency-disorders.html>).

Zinc is another micronutrient that is gaining importance. Current evidence indicates that preventive zinc supplementation reduces the incidence of diarrhoea by 27 per cent among young children and acute lower respiratory infections by 15 per cent (Browne *et al.*, 2009). The GOI has a initiative to provide zinc for diarrhoea prevention through the health workers. It is also noteworthy that the Department of Agriculture in some parts of India has initiated steps for bio-fortification (http://www.zinc.org/info/zni_india_program).

C. Self Help Groups, Women's Health and Empowerment

1. Empowerment of Women through Self Help Groups

Empowerment in the context of women's development is a way of defining, challenging and overcoming barriers in a woman's life through which she increases her ability to shape her life and environment (Sharma and Varma, 2008). SHGs are powerful instrument in terms of alleviating poverty and aiding women empowerment (Narang, 2012). A study conducted by Mohamed (2004) showed that due to the raise in the economic status and greater social standing through education and training in SHGs paved the way to break the social evil dowry.

Kondal (2014) opines that participation of women in SHGs showed a positive impact on the life of poor women and empowered as individuals, family and in the society.

Reji (2013) stated that participation in Self Help Group helped the poor women to meet their credit needs through thrift and also created the habit of saving and enhanced the equality in family and society. A study conducted by Dash (2013) has listed some of the achievements of women after joining in SHG as 1) there is an improvement in the monthly income. 2) development of their own skills 3) Increased self confidence and self reliance 4) increased leadership qualities 5) decline in domestic gender based problems like dowry, polygamy and domestic violence were reduced due to their improvement in economic opportunities.

Rahman (2013) pointed out that women have to come forward to change their status and he also identified some of the empowerment mechanisms. They include knowledge about their rights, self reliance and self respect, credit support for self employment, greater work participation in modernized sector, opportunities in governance, higher age at marriage and higher education.

Thangamani and Muthuselvi (2013) conducted a study on women empowerment through self help groups with special reference to Mettupalayam Taluk, Coimbatore District and observed that 39 per cent of the women are enriched with the saving habits, 31 per cent started small petty shops, 80 per cent

of the women motivated other women to join in SHG, 88 per cent are economically independent and 48 per cent of the women are self confident after joining in SHG.

In an effort to compare the decision making power of the women in SHG and non SHG women in farm activities by Pal (2014) found out that the decision making level of SHGs was high when compared to non – SHGs. As per Sharma *et al.* (2013) decision making level of women in family affairs is lower than their male counterpart.

Participation of women in SHGs empowered the women in terms of social and economic aspects and created awareness on savings, health, environment, hygiene and family welfare (Raj, 2004).

Jain and Nai (2013) studied the effectiveness of SHGs in empowering women and the extent of rural women's interest towards SHG found that there was an increased scope for self employment, greater possibility of savings and increased family income. He also stated that the association with SHGs are greater and the benefits are also greater.

As a member in Self Help Group 81.54 per cent of the women received benefits like economic independence and self –confidence, 76 per cent had the promotion of savings habit and 75.17 per cent had social cohesion and 63.36 per cent had the freedom from debt (Kotishwar and Khan, 2010).

Self Help Groups help the women in India for the maximum utilization of human resources, local natural resources, Gandhian way of promoting the economy, helping weaker section, self confidence and overall economic development (Loganathan, 2004).

Kala (2004) reported that apart from savings and internal lending activities, Self Help Groups play an important role in dissemination of knowledge on health and nutrition, education and also improving the leadership qualities.

Self Help Groups help the women to overcome exploitation, create confidence, enable women to deal with several forms of exploitation, create

opportunities for women for education and awareness, encourage decentralized problem analysis and periodic group based savings and credit (Alamelu, 2005).

Formation of Self Help Groups in rural areas has created social and economic awareness among women. Through self help group most of the women are able to increase their income level and contribute to the development of family. They are participating in the financial decisions of the family, exchanging nutrition knowledge, legal aspects, child rearing, sanitation and dowry related issues (Kumar, 2005).

Self Help Group association help the women to gain control over material possession, knowledge, idea and information sharing in family and community (Suja, 2012).

Kumar (2009) opines that self-help groups play an important role towards improving women's health and empowerment as well as for achieving 'Millennium Development Goals' in developing countries.

2. Studies on Self Help Groups

SHGs are voluntary associations of 10 -20 persons (generally women) who come together to solve their problems based upon mutual help and collective basis. The main reason behind the formation of SHGs is that poor people find it extremely hard to solve their problems individually but once they form a group it becomes considerably easier to tackle problems. These groups are known by different names in different places. Some of the terms used in India for these groups are –Sangha, Samooh, Mandal, Dangham, Samiti, depending upon the region (Chakravarty and Jha, 2012).

Poor people voluntarily involve themselves to form a group for a collective purpose of getting out of their poverty struck life and their own socio-economic advancement. The concept of Self Help Group has caught up with the momentum of women's development. In fact women's Self Help Groups have become a movement in India. It is considered as the most powerful means to strengthen the socio-economic development of women through integrated approach (Devasia and Antony, 2004).

In the view of Kondal (2014) women participation in Self Help Groups have obviously created tremendous impact upon the life pattern and style of poor women and have empowered them at various levels not only as individuals but also as members of the family of the community and the society as a whole. They come together for the purpose of solving their common problems through self-help and mutual help.

Microcredit is not a panacea, but could help to improve the health of poor women by addressing certain issues relevant to the context. In Kerala, SHG participation can help protect poor women against exclusion to health care and possibly aid in promoting their mental health (Mohindra *et al.*, 2008).

Dhavamani (2010) conducted a study on “Empowerment of Rural Women through SHG in Sattur Taluk of Virudhunagar District”, From the study it has been observed that there was a significant difference in the family income, bank savings and loan received by the members of the SHG before and after joining the groups. The study concluded that the respondents mainly got loan to educate their children, start business, to meet medical expenses, to meet marriage expenses, redeem other loans, to maintain house expenses and to meet festival expenses respectively. The study concludes that SHG model paves the way for the empowerment of women and builds confidence in them to stand on their feet. Thus the concept of SHG moulds women as responsible citizens of the country achieving social and economic status.

Women and SHGs in many parts of the country have achieved success in bringing the women to the main stream of decision making. The SHG in our country has become a source of inspiration for women’s welfare formation of SHG is a viable alternative to achieve the objectives of rural development and to get community participation in all rural development programmes. SHG is also a viable organized setup to disburse micro credit to the rural women and encouraging them together into entrepreneurial activities. (Abdul *et al.*, 2007).

In India, the SHGs constitute a widely accepted development strategy for poverty reduction as they are perceived as powerful vehicle for the promotion of micro-credit and micro-finance especially for women (Chen *et al.*, 2007)

Rekha and Goankar (2001) in her study concluded that the movement of SHGs can significantly contribute towards the reduction of poverty and unemployment in the rural sector of the economy and the SHGs can lead to social transformation in terms of economic development and the social change

Venkatesh and Kala (2010) in their work on Self help groups described it as a tool to boost up women Empowerment -The self help group model has been identified as a potential pathway to alleviating poverty. The number of poor women and men who are enrolling in SHGs all over rural India has been increasing remarkably. They are not only active in thrift and credit management but are also taking up their activities, such as natural resource management and development, literacy, knowledge management, nutritional security etc. SHGs lay the foundation for self reliance through building up of institutions, which have the capacity to generate employment opportunities for the rural poor and the poorest and lead to job led economic growth.

Women in SHGs can work together to address issues that affect not only their own members, but others in the larger community. Thirty per cent of SHGs in the sample have been involved in community actions such as 43 per cent improving community services 31 per cent trying to stop alcohol sale and consumption contributing finance and labour for new infrastructure and 12 per cent protecting natural resources and acts of charity (to non-members) (APMAS, 2006).

Self-help groups are generally facilitated by NGOs, and increasingly advise and train members in a variety of on- and off-farm income-generating activities (http://www.ifad.org/evaluation/public_html/eksyst/doc/insight/pi/india-13.htm).

SHGs are a viable alternative to achieve the objectives of rural development. SHG play a pivotal role in social transformation and social economic betterment of rural women (Anila, 2012).

In India SHGs are groups of 10 to 20 women initiated by a development agency (such as an NGO, state development department, or bilateral and multilateral agency) for a purposeful development intervention (Kannabiran, 2005).

SHGs have become a dominant, important, and effective means for empowering women in parts of the majority world. When run on participatory lines and within enabling partnerships, they can enable the strengths of women in India to transform their position away from being marginalized and towards change agents and participating citizens (Tesoriero, 2005).

Women exclusion is most pronounced in countries that are extremely poor and those where women have been historically marginalized. Discrimination in public and political life as well failure to take into account gender perspectives in development planning and resource allocation were the main factors for social exclusion. Women are affected not only due to social exclusion but also by the financial exclusion. One of the solutions to reduce social and financial exclusion pertaining to women was the introduction of micro finance institutions. Membership of the Self Help Groups has contributed to significant changes in the lives of women. The financial inclusion through microfinance could lead to social inclusion (Ambigadevi *et al.*, 2012).

SHGs are considered as the main channel for generating income to the women in all areas particularly in rural and semi-urban areas. The growth of Self-Help Groups (SHGs) is evidence of the fact that women are coming out of their shells, shunning their secondary citizen status and are using their potentialities and talents for individual and societal benefits (Shanthi and Ganapathi, 2012).

According to Saranya and Vishnupriya (2015) Self-help groups are seen as instruments for a variety of goals including empowering women, developing leadership abilities among poor people, increasing school enrollments, and improving nutrition and the use of birth control.

By participating in SHG the respondents were able to access formal banking institution with easy and access better amount of loan as compared to pre SHG period. Most respondents were able to attend training after joining SHG which had an impact in enabling them increase asset, improve book keeping, spend wisely, and diversify investment (Chepchirchir, 2013).

The growth of Self-Help Groups (SHGs) is an evidence of the fact that women are coming out of their shells and maintaining their citizenship in the city (Rajesekaran and Sindhu, 2013).

Self Help Groups enhance the quality of status of women as beneficiaries, decision-makers, participants in the social, cultural, democratic and economic spheres of life (Jain, 2003).

In a country like India where there is rich cultural heritage, traditional beliefs, diversified customs, there is still a lack of economic independence, self confidence and women literacy. SHGs are a new horizon for women to overcome the social evils. SHGs pave way for women entrepreneurs for their growth (Maruthupandian and Mythili, 2015).

SHGs had set a new agenda for financial intermediation by banks in the form of micro-credit . It has infused dynamism among its members to climb up socio-economic ladder in the development process (Kotishwar and Khan, 2010).