



**REVIEW ARTICLE**

**NUTRITIONAL CRISIS IN INDIAN GIRL CHILD DURING THE LAST DECADE AND ITS EFFECTIVE MANAGEMENT BY SIDDHA SYSTEM – A STATUS REVIEW**

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**ABSTRACT:**

There is an immediate and imminent need to answer the question of ill health and health awareness issues of girl children and young girls. They form the fulcrum of the inter-generational health status. Educating the girl child is being given due importance in the recent years. But still there is inadequacy in advocacy of highlighting the unmet needs of the micronutrient and macronutrient deficiencies in girl children. Siddha, one of the AYUSH systems being practiced in southern parts of India emphasizes the importance of girl child, the essential nutritional dietary checklist to be given during important phases of her life. These important phases are when there is an additional demand for micro and macronutrients with increased calorie intake to match with the function of tissue differentiation, reproduction and ageing. The diet recommended in Siddha texts and being part of Tamilian cuisine, these foods are entirely homemade, nutritionally dense and economically cheap and easily acceptable to the multi-cultural palatal preferences.

**Key Words:** Siddha, Micronutrient, Macronutrient, AYUSH

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## INTRODUCTION

Nutrition, the core pillar of life plays a key role in an individual's health and performance<sup>[1]</sup>. Being the basis of a country's all-round development, it cannot be undermined. A healthy dietary pattern along with adequate maternal body nutrient composition, metabolism, placental nutrient supply reduces the maternal and foetal risks in the long run<sup>[2]</sup>. Results from several Birth & pregnancy cohorts describe association between inadequate dietary pattern of the mother and poor health outcomes of the neonates and infants<sup>[3], [4]</sup>.

Amidst the impressive GDP, India is currently one of the nations with highest demographics of malnourished children, double that of Sub-Saharan Africa<sup>[5], [6], [7]</sup>. One main reason for it being, gender specificity or inequality in selection and distribution of food resources happening unconsciously. Micronutrient deficiency (MND) is rampant among girl children besides calorie and protein deficiency. From protein calorie malnutrition to deficient protein utilization and low resistance to infections occur at young age<sup>[9]</sup>. About 70% of non-pregnant women and 75% of pregnant women are anaemic according to a finding in 2000<sup>[10]</sup>.

## MATERIALS AND METHODS:

A literary search was done in the PubMed Online search Portal with terminologies "Girl child", "malnutrition", "Indian Girl child", "Nutritional status". Web portals of important organizations such as "UNICEF", "WHO", "CDC", "Save the children" fighting for children cause was searched for recent statistics and status of micro and macro nutrient deficiency status of girl children in India. Important websites of National survey and government organizations such as, Ministry of women and Child development, International Institute of Population sciences was also searched for relevant information. In addition, classical views on health aspects and functional nutrient foods were literary searched in related Siddha texts available in Siddha Central Research Institute Library, Chennai.

## BACKGROUND OF THE PROBLEM AND LITERARY REVIEW:

Gender inequality in nutritional status is drastically affecting the quality adjusted life years besides placing an economic burden on the workforce of India as put forth by Noble laureate Amartya Sen<sup>[11]</sup>. *"Women's deprivation in terms of nutrition and health care rebounds on society in the form of ill-health of their offspring — males and females alike."* as quoted by Siddiq Osmani and Amartya Sen<sup>[12]</sup>.

**Table 1: Gender Inequality Index of India as per UNDP Human Development Report**

Name of the Country	Gender Inequality index (Reflects inequality in areas of reproductive health, empowerment, labor force)		Maternal mortality Ratio (Number of deaths due to pregnancy-related causes per 100,000 live births).	Adolescent birth Ratio (Number of births to women ages 15–19 per 1,000 women ages 15–19)
	Value	Rank		
INDIA	0.530	125	174	24.5

It is a distressing fact to note the position of India is way beyond the South Asian averages<sup>[13]</sup>.

Growing girl children are most vulnerable to the consequences and disease burden of the micronutrient malnutrition and their nutritional status becoming an effective indicator of the community health and nutrition<sup>[14], [15]</sup>.

In 2016 GHI (Hunger Index), India has scored a low of 28.5 on a 0-100-point scale

**Table 2: Implications of Malnutrition in India**

Implications in India	Stunted	Wasted	Underweight
% of children in INDIA (RSOC 2013-2014)	38.7	15.1	29.4
% of children in INDIA (NFHS 4, 2015-2016)	38%	21% (7.5%-SEVERLY wasted)	36%

Stunting (Height-for-age index): signifies chronic malnutrition, whereas Wasting (body weight in relation to body height) indices acute malnutrition,

and was being ranked 97th among the 118 countries surveyed. It describes India’s hunger situation as “serious”. The index was released by the International Food Policy Research Institute (IFPRI)<sup>[16]</sup>.

**Implications of Macro nutrient deficiency:**

The implications that child malnutrition have for growth and development are multiple and cumulative<sup>[17],[18]</sup>.

underweight (Weight-for-age) reflects both the case of chronic and acute malnutrition<sup>[19]</sup>.

Several studies conducted reveal that an analysis of 24-hour dietary recall intake data revealed that gross intake of proteins and

calories in the malnourished children were much lesser than normal children (< 80% of RDA) [20], [21], [22], [23].

**Implications of Macro nutrient deficiency:**

Micronutrient deficiency also known as Hidden hunger, is defined as in insufficient dietary intake of nutrients such as Vitamin A, D, Folic acid, Iron, Iodine, Zinc affecting the health and survival of more than 2 billion people worldwide out of which women and children are at most risk. Vitamin and mineral status of India is critical with more than 75% U-5 children suffering from Iron deficiency

Anemia and an annual birth of 50,000 children suffering from Folate deficiency related Neural tube birth defects, serious cause of concern. MND strikes at the core of health and vitality, continuing its tentacles into the next generation forming a framework of intergenerational cycle [24],[25],[26].

Rates of regular consumption of foods rich in iron and vitamin A are low in India, particularly among infants and young children even lower in poorer communities and rural areas [26].

**Table 3: Indian Children’ Vitamin A and Iron rich food intake**

Indian children (6-24 months) who regularly consume	Vitamin A rich foods	Iron rich foods
	39%	only 11%

Several studies indicate that long term Nutritional deprivation among girl children showed them being severely stunted and underweight in addition to faring much worse in health outcomes than the boys when compared to in adult population [27]-[33].

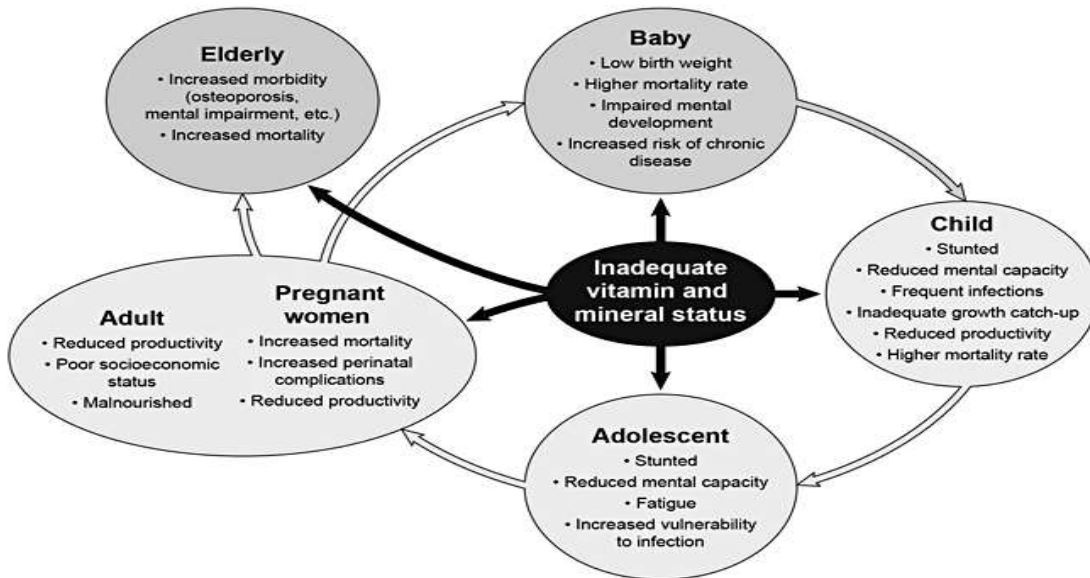
Maternal malnutrition has always been associated with increased maternal as well as infant mortality and morbidity ratios, hence creating enormous disparities and economic crisis.

Under nutrient infants are vulnerable to retardation, micronutrient deficiencies,

common childhood diseases like diarrhoea, acute respiratory infections and are less physically active with slower cognitive developments and serious impairments later in life. These under nutrient girls never reach their full growth potential but rather develop into women (of reproductive age) with micronutrient deficiencies and chronic energy malnutrition as indicated by a low BMI, short stature, anaemia, greater risk of parturition such as early preterm delivery of LBW/VLBW/IUGR babies, obstructed labour, other adverse outcomes such as death due to postpartum haemorrhage, poor lactation,

infants with PEM, realms of Micronutrient deficient disorders (cretinism, goitre, impaired

vision, anaemia, poor growth and delayed wound healing) [34].



**Figure 1: Intergenerational cycle of Malnutrition**

In the same land where there is considerable negligence of nutrition concerned with girl child, lies a glorious past where there were healthy, intelligent women who wielded great power and wisdom together with vitality. Siddha system, one of the ancient systems of medicine hence practiced in parts of India and parts of the world where Tamilians reside speaks high of the nutritional foods advised to be given to the girl children and young women. Siddha system spoke of herbs and foods and was always a part of the Cuisine followed henceforth.

**Glory of Ancient India: The Essence of Traditional foods**

Analysis of historical reports reveal that many of the Indian poets speak highly of women with honour and reverence. To name a few, Avvaiyar, Kaakai padiniyar, Garki vackanavi, Manimekalai who were erudite scholars themselves, practiced chastity, educated masses and walked among great kings such as Chera, Chola, Pandiyar, Janaka. Manimegalai has been described to be women who had good physical composure and was “learned” in all 64 arts. Nevertheless, to say, these women had good health and nutritional status to embark on such tireless endeavors. Back in today’s worrisome situation, we need to think out of the box and replace some of our routine daily foods’ empty calories and

poor nutrition with traditional foods of extreme nutritional importance [35].

Siddha System of Medicine emphasizes the fact “*Unave Marunthu, Marunthe Unavu*” (food is medicine, medicine is food). By reviving ancient traditional and functional foods dispersed throughout various classical texts, the dilemma of addressing Micro and macro nutrient deficiencies among the present generations can be effectively met. These foods deliver good amount of fiber, micro-nutrients, essential amino acids, antioxidant phytochemicals more needed during the reproductive phases of women [36].

M.S.Swaminathan’s global nutrition report 2016 stresses that there is an urgent need to promote the importance of bio-fortified plants like Moringa, Sweet potato, Amla etc. which are bio-reserves helping to overcome hidden hunger caused by micronutrient malnutrition [37].

Traditional practices of Malting, sprouting and fermenting needs to be revived which makes the grains more easily digestible and good source of Bio-reserves. For example,

Fermented foods (such as Idly, Aapam, Koozh, Kali) enhance flavor, increased digestibility and improving nutritional and pharmacological values. They are associated with unique group of micro-biotas which increases the levels of vitamins, proteins, essential amino acids and fatty acids [38].

In women, in addition to supplying essential micronutrients, they improve body’s nutritive reserve and maintain proper functioning of hormones and regular menstrual cycle.

**Siddha provides the panacea:**

Siddha system one of the Indian systems of medicine followed for Centuries in Southern parts of India is with culture and community health, being inherited trans placentally in Tamilnadu. Usage of certain herbal combinations in conducting safe vaginal delivery and lactational enhancement has always emerged from the grandma’s Pandora box. This knowledge could be transferred to all parts of India through ICDS program. The following is an indictment of ancient treasures still in practice.

**Table 4: Benefits of Siddha Medicine in Care of Girl Children and Women.**

S.No.	Siddha Medicines	Benefits
1.	<i>Sei Nei &amp; Urai mathirai</i> in early infancy and childhood	For immune enhancement
2.	<i>Karisalai Karpam, Nellikai Lehyam and Murungai ilai chooranam</i>	Vitamin A supplementation

3.	<i>Pavana Panchangula thylam, Madhulai manapagu, Elathy chooranam, Annabedi chenduram, Amukkara Lehyam, Ulunthu thylam</i>	Ante-natal management of Morning sickness, constipation, Pregnancy induced hypertension, Muscular fatiguability.
4.	<i>Sowbagya Sunthi lehyam, Satavari lehyam, thiriphala chooranam, Ayabringaraja karpam, Pinda thylam</i>	Post-natal management for Lactation, Puerperal tiredness, Anemia, Myalgia.
5.	<i>Ayakantha chenduram, Madhulai manapagu, Amukkara lehyam</i>	General anemia, emaciation due to illnesses (convalescence), improved resistance to diseases.
6.	<i>Muthu chippi Parpam, Pirandai Vadagam, Seenthil tablet</i>	Calcium supplementation during peri and post menopause, (prevention of Osteoporosis).

The above medicines can successfully help to orient the needs of Women population alongside conventional medicines.

**Table 5: Traditionally Important Micro-nutrient rich food substances used in South Indian Cuisine**

S.No.	Food ingredient	Traditional South Indian dishes/Foods prepared	Benefits ascribed in Siddha	Nutritional composition/100 gm of substance
1.	Red rice ( <i>Sivapparisi</i> )	<i>Puttu, panyaram, idiyappam, Palappam, karuppatii appam;</i>	tones reproductive organs, controls bleeding in menstruating women	6.8g protein, 13.45 mg iron, 8.7 mg of calcium; 1.91 mg zinc; rich source of procyanidins, flavones, flavanols, anthocyanins.

2.	Wheat ( <i>Gothumai</i> )	<i>kanji, adai, roti,</i>	broken grains' <i>kanji</i> given during excess bleeding in women, with honey for low back pain;	11.8g proteins, 5.3 mg iron, 41mg calcium.
3.	Black Gram ( <i>Ulunthu</i> )	<i>Kali, ulundan saadam, urundai</i>	Refrigerant, Lactagogue, nervine tonic. Strengthens pelvis, <i>Ukkali</i> given during menarche stage.	24g protein, 1.4gm fat,154 mg calcium, 3.8mg iron, 0.42mg B1, 0.20mg B2, 2mg niacin, 24 µg folic acid, fermentation enhances thiamine, riboflavin and niacin.
4.	Green Gram ( <i>Pachai payaru</i> )	<i>Urundai, Pesarattu, sundal</i>	given during menarche, pregnancy, puerperium and lactation	24gm protein, 124 mg calcium,326 mg phosphorus, 4mg iron, 0.45mg B1, 0.27 mg B2, 0.35mg B6, 145 µg folate, 3.15 µg D2, 0.33mg Vit E, 12.63µg Vit K, 137 µg β carotene, 23.32 µg Se,
5.	Pepper ( <i>Milagu</i> )	<i>Kulambu, rasam, flavouring</i>	restores immunity, antidote, given during puerperium	0.09mg B2,0.27mg B6, 21.89 µg folates,25.68 µg Vit D2,1.27 mg Vit E, 171 µg Vit K, 3.51 µg β carotenes, 405 mg calcium, 11.91 mg Iron,12.13 µg Selenium,1.24 mg Zinc, 196 mg Magnesium,
6.	Asafoetida ( <i>Perungayam</i> )	Flavouring,	Cures Vaginal diseases, Uterine fibroids, Pelvic Infections, given during puerperium	0.82 mg Vit B1, 26.28 µg folates, 12.59 Vit D2, 0.77 Vit E, 46.56 Vit K, 6.42 β carotene, 15.68 mg iron, 266 mg Ca, 96.4 mg Magnesium, 13.48µg Se, 36.33 mg ferulic acid,



7.	Garlic ( <i>Poondu</i> )	<i>Kulambu, kali, soup, poondu paal, rice, chutney</i>	Relieves Edema, Leg pain (during pregnancy), increases lactation	20.08mg Ca, 1mg iron, 0.2 mg Vit B1, 0.25mg B2, 0.56mg B6, 85.77µ Foliates, 12.62mgs Vit C,
8.	Fenugreek ( <i>Venthayam</i> )	<i>Kali, dosai,</i>	Tones reproductive organs, increases lactation, given during pregnancy and lactation	47.55 g total fiber, 51µg folates, 142 µg β carotene, 135 mg Calcium, 8.47 mg iron, 167 mg magnesium,
9.	Moringa leaves ( <i>Murungai Ilai</i> )	<i>Poriyal, sambar, ragi adai, for flavoring</i>	tones reproductive organs, Lactagogue	314 Ca, 4.56 mg Iron, 97 mg Magnesium, 5.95 µg selenium, 0.72 mg Zinc, 0.45mgs Vit B2, 0.87mgs Vit B6, 42.89 µg Foliates, 108 mgs Vit C, 14.33µg Vit D2, 0.31 mgs Vit E, 479 µg Vit K.
10.	Coriander ( <i>dhania</i> )	<i>Thuvaiyal, rice, flavouring</i>	tones reproductive organs, decoction along with jaggery and fenugreek given during pregnancy for facilitation of normal delivery,	0.09 mg B1, 0.05 mg B2, 0.19mg B6, 51µg Foliates, 23.87 mg vit C, 3.55µg D2, 0.46mg Vit E, 274 µg Vit K, 3808µg β carotene, 146 mg Calcium, 5.30mg Iron, 72.68 mg Magnesium, 0.45µg Selenium, 0.68 mg Zinc
11.	Barley	<i>Kanji, dosai,</i>	dehydration states, Lactagogue and diuretic, reduces pedal edema and risk of Pre-eclampsia	15.6g Fibre, 0.36mg B1, 0.18 B2, 0.31 mg B6, 31.58 µg Foliates, 28.6 mg Calcium, 1.56 mg Iron, 48.9 mg Magnesium, 18.61 µg Selenium, 1.50 mg Zinc

12.	Sesame seed ( <i>Ellu</i> )	<i>Urundai, mittai,</i> <i>rice, thuvaiyal</i>	Tonic, Lactagogue, diuretic, Stimulant, Emmenagogue, during menarche, puerperium, lactation	0.34 mg B1, 0.10 mg B2,0.64 mg B6, 127 µg Folates, 67.83 µg D2,0.09mg Vit E,110 µg Vit K1, 13.09 µg β carotene, 1664 mg Calcium,13.9 mgs iron, 390 mg magnesium,15.70 µg Selenium, 8.59 mg Zinc
13.	Bishop's weed ( <i>Omum</i> )	<i>Kali,</i>	Relieves Uterine Diseases, given during puerperium,	0.30mg B1,0.23mg B2,0.24 mg B6,51.79 µg folates,2.62 µg D2,30.36 µg Vit K, 746 µg β Carotene,1034 mgs Calcium,13.65 mgs iron,273 mgs magnesium, 87.74 µg Selenium, 5.67 mgs Zinc.
14.	Dried ginger ( <i>Chukku</i> )	<i>Kali, kaapi,</i> <i>marunthu</i> <i>kulambu</i>	Given during puerperium and lactation	10.82 µg folates,5.43mg ascorbic acid,4.09 µg Vit D2,25.55 µg Vit K1, 88.85 µg beta carotene, (69.21 mgs Calcium dried ginger,)
15.	Cumin seeds ( <i>Seeragam</i> )	<i>Rasam,</i> decoction,	tonic eaten with palm sugar, during menarche and pregnancy to facilitate normal delivery, given as decoction to relieve false pains	0.52 mg B1,0.13mg B2,0.39 mgsB6, 27.79 µg Folates,12.1 µg Vit D2, 1.49 mg Vit E, 146 µg Vit K1, 89µg β carotene, 878mg Calcium,20.58 mg iron,442 mg magnesium,4 µg Selenium, 4.29 mg zinc.
16.	Black Niger seed ( <i>Karunjeeragam</i> )	<i>Marunthu</i> <i>kulambu</i>	Relieves amenorrhea, dysmenorrhea, puerperal pain, Refrigerant,	0.46 Vit B1, 0.23 Vit B2, 0.45 Vit B6, 140 µg folates, 2.52 µg vit D2,1.44 mg Vit E, 110 µg vit K, 2.15 µg beta carotene, 3.62 mg Zinc, 18.19 mgs Iron, 572 mgs

			wound healing,	Calcium, 39.31 µg Selenium,
17.	Palm Jaggery (Panai Vellam)	Kaapi, kali, urundai, mittai, koozh	cures Vatha, Pitha and Kapha diseases; hematinic, reduces gastric reflex	1480 KJ, 0.71 mg Vit B6, 14.40 folates, 0.47 µg Vit D2, 107 mg Calcium, 4.63 mg iron, 0.45mg Zinc

The above food ingredients being rich store houses of Beta carotenes, Vitamin B complex, Folate, Iron, Calcium, Zinc, Vitamin D helps in meeting the increasing nutritional demands [39], [40], [41].

Traditional **Snacks for the girl children** mostly included Flattened rice, red rice, Bengal gram powder, black gram, Chick pea, Ground nut, Sesame, Finger millet, Jaggery, Coconut, Cashew, Wheat, Brown rice, fluffed red rice, germinated cereal flours, Milk, Ghee and Butter. They were simply delicious, energy-dense with high micro-nutritive values and provide better alternative to the junk foods we have incorporated into our dietary regime.

A balanced diet should provide around 50-60% of the total calories from Carbohydrates, 10-15% from proteins, 20-30% from fats. In addition, a balanced diet should provide other non-nutrients such as dietary fibre, antioxidants and phytochemicals. These are required for girl children to meet the demands of growth, development and immunity to fight

infections. In addition, she needs necessary moral support to be able to contain and fight back in circumstances of any crisis situations.

Two examples of such balanced dishes, versatile and suitable for all ages is as follows:

**Pancha Mutti Kanji:** Soup of cooked Bengal gram, Black gram, green gram, split pigeon peas (*thuvaram paruppu*) and raw rice, relieves excessive fatigue and restores strength during convalescence period.

**Paal-Kanji:** Cooked with raw rice and cow's milk, cures hysteria, postpartum depression, tones reproductive organs and is a good galactagogue.

Above given *Kanji* can be used during toxemic states of pregnancy, post-natal puerperium, lactation and other dehydrative states [42].

## DISCUSSION

Although extensive research has been done on issues relating to the social status of adolescents and young women in India, there are only few studies on issues of nutritional

importance to girl child in specific. Under nutrition is predominant in children of underweight mothers whose BMI is below 18.5 than the children of mothers are not underweight.

The Government of India has launched several programs to converge the growing rate of under nutrition children. They include ICDS, NCF, National Health Mission. In 2005 India enacted the National Rural Health Mission (NHRM). Some of its primary goals were to reduce infant mortality, maternal mortality ratio, ensure universal access to public health services and balance the gender ratio. The government of India has brought out the SABLA scheme by merging Nutrition Programme for Adolescent Girls (NPAG) and *Kishori Shakti Yojana* (KSY) to address the nutritional needs of adolescent girls, pregnant women and lactating mothers alongside their empowerment and welfare <sup>[43], [44]</sup>. "*Beti Bachao Beti Padhao*" (Save the Girl Child Initiative), the new watch word for those involved in the girl child protection through initiative of Indian government. The National Institute of Nutrition (NIN, Hyderabad, India) has also released a guiding manual in nutritional matters.

Essentialities are,

- Eating variety of foods (Diversified diet) must be ensured to meet the (Macro & Micro) nutrient demands.

- Regular (Micro & Macro) nutrition screening of Children must be done at all levels (school wise, family wise, district wise) to find out areas of target specificity.
- Education of mothers about "*SISU*" Siddha- traditional feeding practices and stressing importance of girl children at home.
- Involvement of community wise programs particularly in rural areas, to tackle the menace of girl child undernutrition through customary, durable, cost effective and more durable approaches through easy access.
- Following up of malnutrition afflicted girl children and maintenance of registries for review and monitoring.

Education, Nutrition and Skill development among Indian Mothers will go an extra mile in bringing massive change in the health of girl children.

#### **Issues need to be addressed:**

- At individual level: to promote healthy feeding practices, prevention of malnutrition, early screening, diagnosis, appropriate treatment of micro nutrient diseases and rehabilitation of affected children.
- At community level: to improve community behaviour and practices, prevention and malnutrition control

programs, Girl child stigma reduction, Support to affected families through awareness and intervention programs through related AYUSH block development officers.

- At Government Level: to improve adequate monitoring of the implemented programs and facilitate submission of periodical reports on the status of malnutrition (district wise) through the involvement of governmental agencies and NGOs.

Therefore, an integrated and a holistic approach (inclusive of ISM) for the girl child's development is essential in creating a pristine environment in which she can be valued and nurtured.

## CONCLUSION

Possible identification of the micronutrient rich foods through traditional food practises, demographical distribution and suitable promotion through government initiatives will give better results to achieve adequate nutritional health status of Girl children and young women. Latent discrimination among parents, members of society if not recognized and curbed at the possible earliest could lead to disastrous results in respect to overall health and economic outcome of our nation that cannot be reversed. Policies and schemes that promote, educate and advocate eradication of

micro nutrient deficiencies among girl children & women at grass roots level will not only enhance their food security but also nations' millennium goal of development by 2020.

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