Iron fortified salt distribution through integrated child development services in Orissa – an assessment

K.V. Rameshwar Sarma, G.N.V. Brahmam, Ch. Gal Reddy, M. Ravindranath and N. Pralhad Rao

Division of Field Studies, National Institute of Nutrition, Indian Council of Medical Research, Jamai-Osmania P.O., Hyderabad – 500 007, India

The present study was undertaken in two backward districts namely Phulbani and Sundargarh, of Orissa State, India, to study operational aspects of the distribution programme of iron fortified salt (IFS), and the extent of any overlap with the ongoing National Nutritional Anaemia Control Programme (NNACP) and possible toxic effects thereof. All IFS samples tested showed iron levels in the range of 800–1000 mg of elemental iron per 1 kg of iron fortified salt. Distribution of IFS to households was irregular and only 40% of the households had stocks of IFS at the time of home visits. None of the households using IFS reported any kind of adverse effects. Prevalence of anaemia (blood haemoglobin level of less than 11 g/dl) was highest among pregnant women (90.9%) followed by lactating women (88.7%), school aged children (84.4%) and preschool children (77.9%) respectively. Folifer tablets are being distributed to pregnant, lactating women and preschool children. Adult tablets contain 60 mg of elemental iron in the form of ferrous sulphate ($FeSO_4$) and 500 μg of folic acid. Tablets distributed to children contain 20 mg of elemental iron and 100 μg of folic acid. Enquiries regarding distribution of folifer tablets showed that 71% of pregnant women, 22% of lactating women and 22% of children received the folifer tablets at sometime or other and no toxic effects were reported. These results indicate the necessity for some modifications in existing strategies for distribution of IFS in order that it be effective in the prevention of widespread anaemia.

Introduction

In March 1990 the Government of Orissa State, India initiated a programme for the distribution of iron fortified salt (IFS) through the Anganwadis network in three backward districts of the State, namely Phulbani, Sundargarh and Koraput. An Anganwadi centre is the functional unit of the Integrated Child Development Services (ICDS) covering a population of about 1000 in rural/urban areas and 700 in tribal areas. The ICDS has been implemented in all the 25 States and 7 Union territories of India expanding in phased manner in all the districts. Presently there are about 3000 ICDS projects, each project covering a population of about 1 lakh (=100 000). Services rendered at Anganwadi centres are:

i) Supplementary nutrition
ii) Immunization
iii) Health check-up
iv) Referral service
v) Treatment of minor illnesses
vi) Nutrition and health education for women
vii) Preschool education for children in the age group 3–6 years
viii) Convergence of other supportive services like water supply and sanitation.

The strategy of distribution adopted was to supply IFS through Anganwadi centres with instructions for its use in the preparation of food supplements meant for feeding children and women, and its distribution in packets of 0.5 kg to households with adult beneficiaries, ie pregnant and/or lactating women. Domiciliary supply was at the rate of 0.5 kg IFS per beneficiary per month. Since the Government of Orissa intended to extend the programme to other districts in the State, a study was undertaken in districts with an IFS distribution programme to ascertain the usefulness of the strategy. Specific objectives of the study were:

1 To assess operational aspects of the programme.
2 To study the extent of any overlap of this programme with that of 'folifer' tablet distribution under the National Nutrition Anaemia Control Programme (NNACP) and the possibility of toxicity or other adverse effects arising from the overlap of the two programmes.

Methods

For the purpose of the study two districts, Phulbani and Sundargarh, were selected. From each district one

Correspondence address: Dr K.V. Rameshwar Sarma, Senior Research Officer, Division of Field Studies, National Institute of Nutrition, Jamai Osmania P.O., Hyderabad – 500 007, India. Fax +91 842 869074.

Table 1. Study coverage particulars of IFS distribution through ICDS in Orissa.

District	Block	AWCs	HHs	Preschool children	Pregnant women	Lactating women
Phulbani	Gumagarh	10	100	282	21	42
Sundergarh	Subdega	11	93	320	23	99

block was chosen, and within the selected block ten villages with Anganwadi Centres (AWCs) were studied.

Within each village ten households (HHs) with ICDS beneficiaries were chosen for assessing the consumption of IFS and folifer tablets. From each village 30 preschool children aged between 1–6 years and 10 women beneficiaries (5 pregnant and 5 lactating) were examined for haemoglobin status. Finger prick blood samples were obtained by trained technicians using haemoglobin pipettes on Whatman No. 1 filter paper strips. These were transported to the National Institute of Nutrition at Hyderabad where haemoglobin levels were estimated using Drabkin's solution (Cyanmethemoglobin method). Questionnaires were canvassed on Anganwadi workers and women beneficiaries, in order to obtain details of the distribution of IFS and folifer tablets and their consumption.

Coverage

From the two ICDS blocks, namely Gumagarh (Phulbani district) and Subdega (Sundargarh district) a total of 193 households were investigated. Sixty-six salt samples collected from the AWCs/HHs were examined for their iron content. Two hundred and eighty two preschool children, 21 pregnant women, 42 lactating women from Gumagarh block and 320 preschool children, 23 pregnant women and 99 lactating women from Subdega block were examined for their haemoglobin status (Table 1). In addition, blood samples were collected from 224 children between the ages of 6 and 14 years from Ashram schools to estimate haemoglobin status.

Results

Distribution of iron fortified salt

Iron fortified salt was stated to be distributed on a monthly basis. But it was found that most of the beneficiaries had only received 0.5 kg of IFS once in 2 or 3 months.

Iron levels in iron fortified salt

All the samples of IFS tested in the two districts showed iron levels in the range of 800–1000 mg per 1 kg of iron fortified salt.

Distribution of folifer tablets

In Phulbani district, out of the 20 Anganwadi workers only two workers had stocks of these tablets. The folifer tablets for child beneficiaries were distributed by the Anganwadi workers, while for women it was the Auxiliary Nurse Midwife (ANM) who supplied the tablets during her domiciliary visits. In Sundargarh, an ANM distributed the tablets to both children and women with the help of an Anganwadi worker. Seventy-one per cent of pregnant women and 22% of lactating women stated that they had received the tablets at some time or other in lots of 30 tablets. Only about 22% of the mother respondents stated that their children were given small tablets/liquid. But none of the respondents were able to show any folifer tablets during interview.

Salt consumption at Anganwadi level

In the AWCs the IFS was added to supplement the *kheer* during the process of cooking. *Kheer* is a gruel/porridge-like sweet preparation of broken wheat, green gram dal and jaggery. Depending on the total number of beneficiaries registered or attending the centre, the amount of IFS used varied from 100–200 g/d. At this rate, the daily intake of IFS at the centre worked out to be 1–2 g per child and 2–5 g per woman beneficiary which in terms of iron would be 1–2 mg and 2–5 mg respectively.

Salt consumption at household level

Out of the 193 households visited for ascertaining the receipt of the salt, only in about 41% of households could the stocks of IFS be seen, despite 93% of respondents stating that they received salt at some time or other (Table 2). The frequency of distribution was reported to be irregular. The IFS was invariably used in the cooking of family meals, and none of the households reported any adverse effects after using IFS; 58% of the respondents complained that the supply was not regular and sufficient to meet their family requirements.

Table 2. Distribution of households according to iron fortified salt supply

		n	% HHs
i)	Households covered	193	100.0
ii)	Receiving salt	180	93.3
iii)	Having stocks at the time of survey	79	41.0
iv)	Frequency of supply		
	a) Monthly	34	18.9
	b) Bi-monthly	28	15.5
	c) Tri-monthly	14	7.8
	d) Irregularly	104	57.8

Question of toxicity

Each and every woman contacted was specifically questioned whether she or her child partaking in a supplementary feeding programme suffered from any of the ill effects of iron toxicity, such as headache, blurred vision, diarrhoea, abdominal pain, passing of black coloured stools etc. None of the respondents complained of any of the above symptoms. It may however be noted that the ingestion of folifer tablets was quite irregular and the quantity of iron fortified salt distributed was quite inadequate.

Table 3. Percent distribution of beneficiaries according to degree of anaemia

Beneficiary	*n*	Degree of anaemia (haemoglobin g/dl) Normal >11	Mild 9–11	Moderate 7–9	Severe <7	Total anaemic <11	Mean haemoglobin (g/dl) ±SD
Preschool children	602	22.1%	53.7%	19.9%	4.3%	77.9%	9.9+1.54
School children	224	15.6%	54.5%	27.2%	2.7%	84.4%	10.7+1.49
Pregnant women	44	9.1%	59.0%	20.5%	11.4%	90.9%	9.3+1.75
Lactating women	141	11.3%	49.0%	31.2%	8.5%	88.7%	10.3+1.54

Haemoglobin status

Results of analysis of blood samples for haemoglobin indicated a high prevalence of anaemia. According to cut-off points recommended by the World Health Organization (WHO). About 78–91% of subjects had haemoglobin levels of less than 11 g/dl (Table 3). Relatively more pregnant women (90.9%) were anaemic compared to the lactating women (88.7%). So also were more school-aged children (84.4%) compared to preschool children (77.9%) found to be anaemic.

Limitations in IFS distribution

The main limitations acting as deterrents in the distribution of iron fortified salt in the programme were as follows:

i) In ICDS centres the preparation of sweet supplement (*kheer*), seemed to limit the scope for adding larger amounts of iron fortified salt.
ii) In the 'take-home' approach, the fate (consumption) of the supplement (salt) is known to depend more upon the attitude of the family members, especially the head of the family who determines how the salt is utilized.

Discussion

Nutritional anaemia is a major public health problem affecting the health of children and women. Food stuffs which provide iron in the areas of study are parboiled rice, dals, green leafy vegetables and other vegetables. The recent revelation that many common Indian foods contain lower amounts of iron than has been hitherto reported suggests that the mean intake levels of dietary iron per se are deficient in our diets. Recognizing the need to tackle the problem the Government of India introduced a National Anaemia Control Programme in the 1970s through which all preschool children and expectant or nursing women receive iron and folic acid supplements. However, the coverage of children and women as beneficiaries under this programme has been identified[1] as being quite poor. Therefore the search for an alternative approach to prevent anaemia lead to the idea of fortifying common salt with iron. Technology[2] is now available to fortify common salt successfully with iron, and community studies have clearly shown the beneficial effect in improving haemoglobin status on consumption of iron fortified salt (IFS).

Fortification of common salt with ferrous sulphate and sodium hexametaphosphate is considered to be a satisfactory method for the production of iron fortified salt. There is no discolouration of the fortified salt. Iron stability is satisfactory. Iron absorption from cereal-based meal is around 7% and from wheat-based meal about 4%. It is now felt that both available strategies could be effectively utilized to tackle the problem of widespread anaemia in population groups. While IFS distribution can serve as a preventive measure, folifer tablet distribution can profitably be used as a strategy to control anaemia in particularly vulnerable groups throughout the country.

The very high prevalence of anaemia in the region of Orissa indicated the need for public health intervention programmes on a broad scale. Anaemia, especially in children, is known to lower resistance and increase vulnerability to infections. Adverse effects of repeated infection on the growth process of children is well known[4,5]. Anaemia in school-age children is reported to interfere with their learning abilities[5,6]. Soemantyi Ernato Oollitt and Insun Kim have found significant improvements in the school achievement test scores of iron-deficient anaemic children after supplementing their diet with iron for a period of three months[5]. Thomas E. Webb and Frank A. Oski have found that results of IOWA tests of basic skills, a measure of scholastic performance, are significantly lower in anaemic children[7]. Anaemia in pregnancy is known to have a deleterious effect on the outcome of pregnancy. In the lactating period, anaemia may interfere with the demanding needs for the caring abilities of mothers, thus making children more vulnerable. Mamdouh Hanafy has observed a significant correlation between haemoglobin level and initiation of lactation and found that women with haemoglobin levels of less than 8.5 g/dl were less likely to breast-feed their children when compared with women having haemoglobin levels of more than 8.5 g/dl[8].

Therefore there is a need to strengthen and effectively implement the existing National Anaemia Prophylaxis Control Programme. There is also a need to modify the existing strategy of distribution of iron fortified salt so that the stipulated quantities of iron per beneficiary (5 mg per child and 15 mg per woman per day) reaches every beneficiary. This is possible only if the IFS is supplied on take home basis 'regularly', considering the 'household' as a unit and not the beneficiary. One of the ways will be to supply the salt at a rate of 0.5 kg per person per month, to the households.

There is a need to develop a mechanism to monitor the regular flow and quality of IFS supplied. The effectiveness of such supply can be monitored by estimating haemoglobin levels at least once every three months in the vulnerable groups.

One of the important features of the Ashram Schools started for children in the tribal areas is that they are

residential in nature in order to meet all the requirements of growing children. In these schools children are provided two meals a day cooked in a common kitchen. Thus, supply of IFS to these schools can provide for a large section of the vulnerable groups in the area.

As the universal iodization of salt is on the anvil in India and as technology is now available to fortify common salt with both iodine and iron and the problems of anaemia and iodine deficiency disorders co-exist, it may be necessary to consider distribution of double fortified salt (iodine and iron) instead of IFS alone.

Acknowledgements – The authors are grateful to Dr Vinodini Reddy, Director, National Institute of Nutrition, for her keen interest in this study. They thank the Government of Orissa for enabling them to undertake this study. They acknowledge the technical help rendered by Mr Pothu Raju and Mr Sreenivas.

References

1 Evaluation of the National Nutritional Anaemia Prophylaxis Programme – An ICMR task force study. Indian Council of Medical Research, New Delhi, 1989.

2 Datta RN, Halder K, Krishnamurthy KA, Narasinga Rao BS, Nath LS, Sood SK, Srikantia SG. Use of common salt fortified with iron in the control and prevention of anaemia – a collaborative study. Am J Clin Nutr 1982; 35:1442–51.

3 Ranganathan S. Fortification of common salt with iron: use of polyphosphate stabilisers. J Food Chem 1992; 45(4):263–8.

4 Collaborative study on high risk pregnancies and maternal mortality – An ICMR task force study. ICMR, New Delhi, 1990.

5 A National Collaborative study of identification of high risk families' mothers and outcome of their offspring with particular reference to the problem of maternal nutrition, low birth weight, perinatal and infant morbidity and mortality in rural and urban slum communities – An ICMR task force study. ICMR, New Delhi, 1990.

6 Soemantri AG, Ernato P, Insun, K. Iron deficiency anaemia and educational achievement. Am J Clin Nutr 1985; 42:1221–8.

7 Webb TE, Oski FA. Iron deficiency anaemia and scholastic achievement in young adolescents. The J Pediatr 1973; 82:827–30.

8 Mamdouh Hanafy M. Maternal nutrition and lactation performance in Egypt. In Hugo Aebi, Roger Whitehead (eds): Maternal nutrition during pregnancy and lactation: A Nestlé foundation workshop, Lausanne, April 26 and 27, 1979. Bern, Stuttgart, Vienna: Hans Huber, 1980; p 225.

Iron fortified salt distribution through integrated child development services in Orissa – an assessment

K.V. Rameshwar Sarma, G.N.V. Brahmam, Ch. Gal Reddy, M. Ravindranath and N. Pralhad Rao

Asia Pacific Journal of Clinical Nutrition 1992; **1**: 239–243

摘要

ORISSA聯合兒童生長服務機構的强化鐵鹽配給：一個評價

該强化鐵鹽配給計劃是在ORISSA州 PHULBANI和SUNDARGARH兩個落后地區開展，并與國家營養性貧血控制計劃交叉進行， 同時研究其可能毒性。所有强化鐵鹽(IFS)樣品鐵含量爲每公斤８００－１０００毫克。强化鐵鹽配給到户是不規律的， 家訪時僅４０％的家庭有强化鐵鹽貯存。没有用户報道强化鐵鹽有任何有害的作用。 貧血（血紅蛋白＜１１克％）的發病率以孕婦爲最高（９０.９％），依次分别爲授乳婦（８８.７％），學齡期兒童(８４.４％)和學齡前期兒童（７７.９％）。Folifer片劑配給孕婦， 授乳婦和學齡前期兒童。 配給成人的片劑每片含元素鐵６０毫克（硫酸鐵型式）和葉酸５００微克， 配給兒童的片劑每片含元素鐵２０毫克和葉酸１００微克。調查顯示，配給Folifer片劑的７１％孕婦，２２％授乳婦和２２％的兒童均無毒性作用，最后作者指出， 目前的强化鐵鹽配給計劃必需作某些改進，使其對廣泛貧血的預防産生更好的效果。

Iron fortified salt distribution through integrated child development services in Orissa – an assessment

K.V. Rameshwar Sarma, G.N.V. Brahmam, Ch. Gal Reddy, M. Ravindranath and N. Pralhad Rao

Asia Pacific Journal of Clinical Nutrition 1992; **1**: 239–243

భారతదేశంలో ఒరిస్సా రాష్ట్రంలోని వెనుకబడిన పుల్బాణి మరియు సుందర్‌ఘడ్ జిల్లాలలో ఈ మదింపు కార్యక్రమము రెండు కారణాల వల్ల చేపట్టబడింది. మొదటిది ఇనుముతో సమ్మిళిత పరచబడిన ఉప్పు పంపిణీ కార్యక్రమ నిర్వహణలోని గుణగణాలు తెలుసుకోవడం, రెండవది దేశంలో ఇప్పటికే అమలులో ఉన్న జాతీయ పోషక సంబంధిత రక్తహీనత వ్యాధి నివారణ కార్యక్రమం దీనితోబాటు అమలులో ఉన్నందువల్ల కలిగే సాధక-బాధకాలు గుర్తించడం. పరీక్షా సమయంలో ఇనుముతో సమ్మిళిత పరచబడిన ఉప్పు నమూనాలన్నిటిలో ఒక కిలోకు 800–1000 మిల్లీగ్రాముల ఇనుము ఉండినది. పరిశోధకులు వెళ్ళిన సమయంలో ఇనుముతో సమ్మిళితమైన ఉప్పు నిల్వలు కొద్దో గొప్పో కేవలం 40 శాతం కుటుంబాలలో మాత్రమే వున్న కారణంగా ఈ కార్యక్రమం సక్రమంగా అమలు జరగడం లేదని తేలింది. అంతేకాకుండా ఇక్కడి జనాభాలో రక్తహీనత (100 మి.లీ. రక్తంలో 11 గ్రా. కంటే తక్కువ హిమోగ్లోబిన్)కై జరిపిన రక్త పరీక్షలో గర్భిణీ స్త్రీలల్లో 90.9 శాతం, బాలింతల్లో 88.7 శాతం, బడిపిల్లల్లో 84.4 శాతం మరియు 5 సం॥లలోపు పిల్లల్లో 77.9 శాతం రక్తహీనత ఉన్నట్లు తెలిసింది. ఈ ప్రాంతంలో రక్తహీనత నివారణకై "ఫోలిఫర్" మాత్రల పంపిణీ కార్యక్రమం కూడా అమలులో ఉండినది. గర్భిణీ స్త్రీలు – 71.0 శాతం, బాలింతలు, చిన్నపిల్లలు – 22 శాతం తప్పున ఈ "ఫోలిఫర్" మాత్రలు కనీసం ఒక్కసారైనా తమకు లభించనట్లు, అవి వాడటం వల్ల తమకు యేటువంటి దుష్ఫలితాలు లేనట్లు తెలిపారు. ఈ పరిశోధన వల్ల తెలిసిన దేమిటంటే ప్రస్తుతం అమలులో వున్న "ఫోలిఫర్" మాత్రల పంపిణీ కార్యక్రమంతోబాటు, కొన్ని మార్పులతో ఇనుము గల ఉప్పును అందివ్వడం సమర్థవంతంగా నిర్వహిస్తే, దేశంలోని జనాభాలో విస్తృతంగా వ్యాపించివున్న రక్తహీనతను నివారించడానికి వీలుపడగలదు.