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Nutrition And Leprosy

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In this paper we briefly review some of our recent work on the nutritional aspects of leprosy, and also draw attention to related contributions of other scientists in India and abroad.

Foster *et al*[4] had recently reviewed the available literature on nutrition-leprosy inter-relationship (145 references). Despite much suggestive evidence of the supportive contributory role of good nutrition towards better prognosis and management of leprosy, the precise role of specific nutrients in the pathogenesis of leprosy is still not clear. This is an area – hitherto somewhat neglected – which merits serious attention from nutrition scientists and leprologists. We hope that this brief report will stimulate further interest in this area.

Protein-Energy Nutrition In Leprosy

Rao *et al*[13] measured body-mass indices of lepromatous patients and compared the data with those of age and sex-matched controls in the mining district of Singhbhum in Eastern India. They also estimated the daily protein and energy intakes of the two groups using weighment and oral questionnaire methods.

Fifty-two percent of lepromatous subjects and 39 percent of control subjects, both belonging to poor income groups, could be considered as being in grade II undernutrition on the basis of their anthropometric status. While 13 percent of the patients could be classified as falling under grade I undernutrition, there were 14 percent controls in this category. There was no subject (cases or controls) suffering from grade III undernutrition. These data would show that nearly one-third of lepromatous cases did not show anthropometric evidence of undernutrition. Differences in the calorie intake of cases and controls were marginal and apparently not significant. These data, despite their limitations, would seem to provide no evidence of the contributory role of protein-energy undernutrition in leprosy.

Table 1: Vitamins A and E levels in normal controls and leprosy patients (Mean ± S.D.)

Group	vitamin A (n)	vitamin A μg/dl	vitamin E (n)	vitamin E mg/dl
Normal controls	(55)	24.09 ± 7.57*	(55)	0.69 ± 0.22*
Leprosy patients	(55)	12.06 ± 2.14	(59)	0.41 ± 0.04
LL	(15)	9.25 ± 5.81	(15)	0.36 ± 0.22
BL	(15)	13.95 ± 7.93	(15)	0.37 ± 0.16
BB	(10)	13.69 ± 4.82	(8)	0.432 ± 0.19
BT	(9)	13.13 ± 6.88	(9)	0.48 ± 0.19
Histoid	(6)	10.3 ± 4.03	(12)	0.407 ± 0.25

Statistical analysis was done by students 't' test.

**LL, BL, BB, BT, Histoid vs. controls, p: < 0.001, Highly significant.*

Vitamin Deficiency

B vitamins: While Muir[8] had reported in 1928 that deficiency of vitamin B complex did not aggravate the severity of the disease, Badger and Sebrell[1] had claimed, on the basis of studies on experimental animals, that thiamine deficiency resulted in generalised infection and shorter incubation period. In a recent study, Saha and Rao[16] found no significant differences in serum folate and serum vitamin B_{12} levels as between lepromatous subjects and controls.

Fat-soluble vitamins: Rao *et al*[10] observed a moderate lowering of serum vitamin A levels in tuberculoid leprosy patients and a more marked reduction in lepromatous subjects (Table 1) – an observation in line with the earlier report of Sher *et al*[18] of a significant lowering of serum vitamin A levels in lepromatous leprosy patients in comparison with tuberculoid leprosy cases. In fact, Sher *et al*[18] and later Rao and Saha[12] had shown that as the pathological spectrum of leprosy shifted from the tuberculoid to the lepromatous end, there was a progressive fall in serum vitamin A levels.

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Rao *et al*[10] had also reported that serum vitamin A transport proteins, such as pre-albumin and retinol binding protein (RBP) levels were low in lepromatous patients as compared to healthy controls (Table 2). Bharadwaj *et al*[3] had reported low levels of vitamin A in the serum and skin of leprosy patients under clofazimine treatment.

Saha and Rao[16] had reported comparable serum concentrations of 25-hydroxy vitamin D levels in lepromatous leprosy patients and normal subjects.

Rao and Saha[12] had also found that serum concentrations of vitamin E (like those of vitamin A) showed a gradual progressive reduction over the entire leprosy spectrum as compared to values in control subjects (Table 1).

The reduction in serum levels of vitamin A and E observed in leprosy subjects seemed to be disease-related; because as the disease advanced from the immunocompetent tuberculoid state to the immunocompromised lepromatous stage, the serum concentration of the two vitamins progressively declined.

It is interesting in this connection that as early as 1921, Rogers[15] in Calcutta had claimed that administration of cod liver oil to leprosy patients caused some regression of leprosy lesions.

It is necessary that the significance of the changes in the serum vitamin A and E levels in the different clinical forms and stages of leprosy is further elucidated through well-controlled studies on suitable experimental models and the effects of vitamin A and E supplementation on the course of the disease and on the response to therapy in established cases, carefully assessed.

As early as 1955, Manson and Bergel[6] had reported that in rats and hamsters fed on a vitamin E deficient diet, rich in unsaturated fatty acids, growth of M.Leprae was promoted. Bergel[2] proposed that "an altered metabolic ecosystem" increased lipid autooxidation which in turn made the "ground suitable" for multiplication of M.Leprae. These observations need to be placed on firmer and more precise footing. Clearly, there are still many gaps in our understanding of the possible role of the fat soluble vitamins A and E in the pathogenesis and evolution of leprosy.

Table 3: Association of per capita income with dietary intake and serum levels of zinc and copper in healthy subjects and leprosy patients

Group (n)	Per capita income less than Rs.150		Per capita income more than Rs.150	
	Zinc	Copper	Zinc	Copper
a) Healthy subjects (93)				
Dietary intake (g/day)	6.22	1.32	10.64	2.08
Serum levels (μg/dl)	113	99	106	106
b) Lepromatous patients (88)				
Dietary intake (g/day)	5.7	1.27	9.42	1.99
Serum level (μg/dl)	69.9	205	68.8	209

Daily recommended intake of zinc and copper are 12.0 mg and 2.50 mg respectively.

Trace elements: Perhaps, apart from the changes reported above with respect to serum vitamin A and vitamin E levels, the most consistent findings are those related to serum zinc and copper levels in leprosy.

Significantly low serum zinc levels and hypercupraemia in the case of leprosy have been reported by a number of authors, Venkatesan *et al*[20], Sher *et al*[18], Mathur *et al*[7] and Rao *et al*[9]. A faster subsidence of erythema nodosum leporosum has also been reported by some of the same authors following the administration of zinc[7, 20]. The significance of hypozincaemia and hypercupraemia and the biochemical mechanisms underlying these phenomena need to be elucidated through further studies. The inverse relationship between serum zinc and serum copper levels has been well-recognised. That the change in zinc and copper in leprosy is disease-related and not diet-related was shown by Rao and Saha[11], who found that there were no striking significant differences between cases of leprosy and controls with respect to dietary intake of zinc and copper (Table 3). Also cases of leprosy from higher income groups with a better dietary intake of zinc showed the same order of hypozincaemia as those of the poorer income groups and lower dietary zinc intake.

Rao *et al*[10] also found that the serum levels of "diet-independent" proteins – such as Ig G (2075 $\pm$ 592 mg/dl) were not reduced in the leprosy patients in relation to normal controls (1545 $\pm$ 419 mg/dl), while those of "diet-dependent" proteins such as serum albumin, RBP and prealbumin were decreased in lepromatous patients in comparison to the controls (Table 2). Hypozincaemia might be responsible for the hypoalbuminaemia. Alternatively low serum albumin levels may be attributable to the binding of serum albumin with dapsone. Lowered serum concentration of prealbumin and RBP might also be related to the lowered serum zinc levels; positive correlations between serum vitamin A levels and zinc levels were observed in lepromatous leprosy patients[10].

Table 2: Serum levels of zinc binding protein (albumin and macroglobulin) and vitamin A binding protein (retinol binding protein and prealbumin) in controls and lepromatous patients

Group	Albumin g/100 ml (n)	Alpha-2-macroglobulin mg/100 ml (n)	RBP mg/100 ml (n)	Prealbumin mg/100 ml (n)
Controls	4.4 (36)	313 (38)	3.09 (26)	22 (32)
Lepromatous leprosy patients	3.9 (36)	308 (35)	2.56 (68)	11 (56)

Except alpha-2-macroglobulin, serum albumin, RBP and prealbumin levels were low in the patient group.

Serum iron: Sher *et al*[18] had reported significant lowering of serum iron in lepromatous patients (50.1 mg/dl) as compared to tuberculoid patients (99.3 mg/dl), but serum transferrin levels in the two groups were similar. On the other hand, Rao *et al*[10] found that serum levels in lepromatous subjects (153 mg/dl) and in normal controls (152 mg/dl)

were nearly similar and so were the serum transferrin levels. Rao *et al*[10] also found that serum ferritin levels in lepromatous males (120.8 mg/dl) and females (54.8 mg/dl) were comparable to the values observed in normal controls (96.7 mg/dl in males and 43 mg/dl in females respectively). However, Rao *et al*[10] noted significant reduction in haemoglobin levels in lepromatous patients as compared to normal subjects. Again the significance of these observations needs to be investigated.

Nutrition And Metabolism Of Anti-leprosy Drugs

Although there are many studies on the adverse effects of antileprosy drugs and although there are several reports on the modulation of the human immune system by the individual drugs, belonging to multi-drug therapy (MDT), i.e. dapsone, clofazimine and rifampicin there are few publications on the nutritional imbalance, if any, that might be produced by these drugs.

Krishnaswami[5] at the National Institute of Nutrition, Hyderabad, had reported that in leprosy patients on dapsone therapy, the mean albumin and haemoglobin concentrations remained within normal limits. In an animal study, Saha[17] (1990) had shown that rats fed on dapsone, clofazimine and rifampicin had shown a fall of W.B.C. count from 13990 $\pm$ 3797/ mm^3 to 5396 $\pm$ 2241/ mm^3 and a fall of haemoglobin level from 13.1 $\pm$ 0.64 g/dl to 11.3 $\pm$ 0.90 g/dl, but the dosages used in these studies were very large (human dosage levels) and the results may not be of practical significance.

Very little work has so far been done on the effect of antileprosy drugs on the metabolic enzymes handling drugs. In humans, prolonged administration of rifampicin is known to produce proliferation of hepatic smooth endoplasmic reticulum and enhanced content of cytochrome P-450, a drug metabolising enzyme, in isolated liver subfractions. Also hydroxylation of steroids, i.e. ethinylo estradiol and cortisol is found to be affected by rifampicin treatment.

Multi-drug therapy in leprosy is necessarily of prolonged duration. It is important that the impact of such therapy on the nutritional status of the subjects and on their nutrient requirements is clearly understood. It is also necessary to understand how such therapy may modify the patients' ability to metabolise other drugs that may be needed by them for other inter-current ailments.

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REVIEWS AND COMMENTS

Nutrition And Leprosy

The paper on Nutrition and Leprosy by Kunal Saha and Rao[6] in the earlier pages should serve to draw attention to an important aspect of the problem of leprosy which must interest both nutrition scientists and leprologists.

It is estimated that the number of people suffering from leprosy in the world today may exceed 15 million. Of these, as many as 5 million live in India[1]. There can be no doubt, therefore, that leprosy ranks as a major public health problem in our country today.

Hansen discovered the causative organism of leprosy – Mycobacterium Lepra, more than a century ago. The industrialised affluent countries of the world had successfully eradicated leprosy several decades ago – long before the modern powerful anti-leprosy drugs were even discovered. They achieved their success through strict segregation and all-round improvement in the living conditions of their people – including their health, sanitation and nutritional status, and not through specific control programmes based on drugs (which they did not have).

In India, the National Leprosy Eradication Programme was launched in 1954. As part of this programme, multi-drug therapy is being implemented in 85 leprosy-endemic districts of the country. Our present approach to the control of leprosy is, however, heavily (indeed almost entirely) drug-oriented. Apparently we are still far away from the goal of total eradication of the disease.

While we must undoubtedly pursue our present strategy of identifying cases of leprosy in the early stages and giving them the benefit of intensive multi-drug

therapy, we must not slacken our efforts at identifying the factors that may be currently contributing to the continued prevalence of the disease.

In order to prevent the occurrence of new cases, we must gain better insight into its epidemiology. There are some basic issues with respect to the epidemiology of the disease which have not, as yet, been adequately addressed. Out of the nearly 412 districts in the country, prevalence of leprosy, at a rate of five and above per thousand of population, has been observed in 212 districts – i.e. nearly half of the country. The other half of the country is relatively much less affected. Why is this so? The worst affected states are those of Tamil Nadu, Andhra Pradesh and Orissa (all in the South) where the prevalence rate exceeds 10 per thousand of population. On the other hand,in the states of Rajasthan, Haryana, Punjab, Himachal Pradesh (all in the North) and Assam and Arunachal Pradesh (in the East), the prevalence rate is less than two per thousand. The states of Gujarat, Madhya Pradesh, Uttar Pradesh and Kerala have a prevalence rate between two and four per thousand population. In general, therefore, the South (excluding Kerala) and the East (with the exception of Assam and Arunachal Pradesh) seem to bear the brunt, while the northern, central and western parts of the country are relatively much less affected. The three worst affected states together with West Bengal (prevalence rate of five to nine per thousand), all of which fall in the "rice belt", have also been traditionally the "hot-beds" of the most fulminant forms of undernutrition — beri beri, pellagra, nutritional blindness and kwashiorkor, and are still probably among the most poverty-stricken states in the country. Cases of leprosy include a sizeable proportion of children[7].

It may, however, not be justifiable to read too much into this association. While the co-existence of undernutrition and high prevalence of leprosy in some poor population groups may be suggestive of undernutrition-leprosy interrelationship, it must be remembered that severe undernutrition has often been seen in poor population groups in the total absence of leprosy. There has been no evidence of exacerbation of leprosy-prevalence in leprosy-endemic areas in the wake of acute famine[3]. Also, while a majority of cases of leprosy are poor and undernourished, the relatively affluent and well-nourished have not been totally exempt.

In a country like ours where both undernutrition and leprosy are widespread, and in the context of the availability of powerful drugs for the treatment of leprosy, it is necessary that studies on the nutrition-leprosy interrelationship are intensified. Apart from the practical necessity for such studies, Indian scientists can make scientific contributions in this area which may not be possible in other locations.

There has not been much interest in the question of dietary management of leprosy cases. Considering the widespread prevalence of undernutrition and the fact that leprosy is a chronic ailment which calls for prolonged therapy, it is unfortunate that so little attention has been devoted to this aspect.

Saha and Rao's paper[6] points to some consistent positive findings with respect to serum levels of vitamin A, vitamin E, zinc and copper in leprosy. The significance of these observations, from the point of view of susceptibility, pathogenesis and management of leprosy, needs to be clearly established through further intensive studies. In particular, it seems important to elucidate the possible relationship between leprosy and zinc nutrition.

The predominantly cereal-based dietaries of the poor in the country are not only low in zinc but the bioavailability of dietary zinc may also be expected to be low. Prasad[4], who had pioneered studies on zinc nutrition, had recently reviewed the spectrum of diseases that may be conditioned by zinc deficiency. Though he did not include leprosy in his masterly survey, it is interesting that in the Middle East, where Prasad had carried out his initial landmark studies on zinc, leprosy is also an important health problem. Can zinc nutritional status influence the acquirement, course, and progression of leprosy from the immunocompetent to the immunocompromised stage? Does zinc nutrition status condition the response to treatment? Rao and Saha[5] found nearly the same order of hypozincaemia in cases of leprosy with varying levels of dietary intake of zinc, and concluded that hypozincaemia was a disease-related and not a diet-related phenomenon. This conclusion may not still rule out the possibility of the beneficial therapeutic effect of zinc supplementation in the management of leprosy. This is an aspect which would certainly merit further investigation.

It may be far-fetched in the present state of our knowledge to speculate if the high prevalence of leprosy in the South and the Eastern sea-board of India is in any way related to regional differences in dietary intakes of zinc arising from regional variations in soil zinc. We have no data at present to justify such a speculation. Indeed, available data[2] do not point to the positive correlation between soil zinc levels and leprosy endemicity in the country.

Under the circumstances, the practical significance of the biochemical changes reported by Saha and Rao, from the point of view of etiology, pathogenesis and treatment of leprosy, would call for further intensive studies.

We need to broaden our strategy for the prevention and control of leprosy instead of placing our entire reliance on multi-drug therapy of established cases. The "nutritional dimension" of the leprosy problem appears to be a somewhat neglected field which has failed to excite nutrition scientists. It is in this context that the work of Kunal Saha and his associates, briefly reported in this issue, assumes significance and importance. Their brief report may not do full justice to their rich contributions in this area. It is perhaps a reflection of our distorted priorities that work of this kind has attracted scant attention and little recognition. We most certainly need more studies of the kind now being carried out by Saha and Rao in order to be able to combat the problem of leprosy in an effective and comprehensive manner.

C. Gopalan

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Vitamin A Supplementation And Child Mortality

Examination of a claim

J. Cravioto

The claim of Sommer A. *et al* (*Lancet 2:* 586 1983) that just a supplement of vitamin A can bring about a near-miraculous decline in child-mortality among poor populations, and Gopalan's comments (*NFI Bulletin* Volume 7, Number 3, 1990), raise important issues of vital interest to readers working in the Third World.

The majority of the Third World's population of infants and children is in a nutritionally inadequate status. For this population, the primary food problem is that of quantity not quality. This problem is not new and, notwithstanding the spectacular advances in nutritional sciences up to the present, those in charge of operational programmes to combat malnutrition tend to adhere to simplistic concepts, almost of a magical nature and to jump immediately to the application of actions derived from their anxiety to solve highly complicated human problems of a very complex nature, looking at them from a narrow viewpoint. Hope is substituted for scientific judgement.

The discovery of specific nutrient deficiencies among a fraction of the undernourished populations attracts the idea of a rapid immediate solution: give a chemical substance once in a life-time or at large intervals and the problem is gone! The corollary to this posture is that there is no longer the need to search for the roots of the problem, for teasing out its several components, for the scientific test of the efficacy of the measure under local variable conditions, for the actual short-and long-term cost-benefit, for the assessment of repercussions of the measure in terms of ecologic outcome, etc., etc.

When the claim is as tall as that death of infants and children can be prevented by the administration of a single chemical substance, the argument for its immediate use seems compelling. Local experience on the subject, data from similar ecological conditions, studies published in the language of the local scientists, are all excluded whenever they contradict the simplistic solution.

It is easy to verify that too often new technologies, including schemes for prevention and treatment of disease, have been introduced as vertical actions out of context of national or regional programmes without rigorous evaluation. Only exceptionally have these new solutions been tested *vis a vis* measures already in practice. Frequently, the new technology has produced undesirable effects mainly in terms of delays in the achievement of the real solution of the problem. The eagerness to implement the new technology does not allow for the quantification of its true value and the establishment of its limitations. It is always good to remember that the human mind is prone to accept the principle of pseudoparsimony even in the presence of proven multicausal conditions. Evaluation of any technology must include a comparison of alternative uses of the resources employed to carry it on as well as the quantitative estimation of its impact on the quality life of the potential beneficiaries.

The Mexican Experience

In 1955 we started mapping the health, nutrition and socioeconomic conditions of several communities in central rural Mexico with the purpose of selecting one as the site of a field research station. From the data on morbidity it was readily apparent that upper respiratory infections during the first semester of the life of the infants had the highest association with infant mortality, giving way to diarrhoea during the second semester of life.

While getting organised, it was decided to obtain longitudinal data on the physical growth of the infants. One hundred consecutive newborns were to be followed-up from birth to age one year. But, just to collect the growth characteristics did not seem sufficient work; so the design called for 50 randomly selected newborns to receive at birth a single dose of gamma-globulin to prevent its normal decrease reported to occur in the first two months of life. The other 50 infants received an injection of saline solution as placebo. Weight and total body length were obtained every 15 days at the time of a paediatric examination and an interim history of disease was also taken. Dietary intake was recorded on a weekly basis at the time of the home visit.

As expected, there was no difference in morbidity from respiratory infections between the groups. Infant mortality was also not significantly different.

Besides the 100 infants included in the study, 180 more children were born during the calendar year. These "extra" infants seen at birth were not systematically followed up but their families were visited at irregular intervals to collect socio-cultural data and to gain their approval as eventual participants in a longitudinal study on the relationship among nutrition, morbidity, stimulation of the infant and mental development, learning and behaviour.

When the mortality in the total number of infants born in the village was analysed it came as a surprise for the team, which was just acquiring experience in community studies, that the infant mortality rate was only one-half of that expected for that year, in accordance with the estimate derived from the vital statistics data of the previous five years.

It must be borne in mind that during the year of life of the cohort no nutritional or health programme was implemented in the village, only basal data were collected. During the home visits infants were examined at the request of parents, some prescriptions were given and "talk" about health and disease was the central theme of the visit.

More unexpected was the finding that infant mortality was the lowest in the families regularly visited. In an effort to estimate the magnitude of the association between the number of home visits and infant mortality a rank coefficient of correlation was calculated, the value of 0.67 obtained was significantly different from zero.

Very soon after our unexpected finding, we discovered that almost every health worker with field experience knew that this phenomenon is the habitual behaviour of death in communities where health teams start to serve.

It is unfortunate that when a claim is made that a very specific chemical substance such as vitamin A reduces significantly *per se* child mortality, the study design does not take into consideration this aspect which is so fundamental for the correct interpretation of data.

In a study on causes of death in 1,010 malnourished children admitted to the nutrition ward of the Hospital Infantil de Mexico, it was found that the main factors associated with death were, in increasing order of importance: age, intensity of malnutrition, presence of

infections, particularly bronchopneumonia and diarrhoea, electrolyte disturbance and dehydration. None of the so-called specific deficiency lesions attributable to pellagra, ariboflavinosis, mild xerophthalmia, and hypoavitaminosis C, were associated with lethality.

Concluding Comments

I believe that the double-blind study on the impact of vitamin A supplementation on child mortality, carried out by the National Institute of India, is conclusive on the lack of effect of the supplement *per se* on mortality. Once again, we have a clear-cut example that the careful epidemiological analysis of confounding variables resulted in the lack of evidence of a direct specific effect of the supplement on death rates.

It seems appropriate at this point to declare that we are not questioning the prevention of blindness through vitamin A administration, as an emergency task, until children are prevented from nutritional deficiency through adequate socioeconomic and health programmes.

For the health planners and workers of the Third World, the most important knowledge derived from the supplementation studies, both the Indian and the Indonesian, is the re-confirmation that at least child death can substantially be diminished with the implementation of primary health care. Infants and children in economic poor communities die of common diseases whose detection, cure, and even prevention, can be done with non-expensive appropriate technology applied by the primary non-expensively-trained health worker. The experience of many field — well-designed and well-analysed — studies shows that it works. Let us use it.

The author, Director, National Institute of Science and Technology, Mexico, is a distinguished paediatrician and a most outstanding health/nutrition scientist.

We are grateful to UNICEF for a matching grant towards the cost of this publication

Rural Health Care

Towards wider outreach and better quality

C. Gopalan

Considerable proportions of populations of developing countries do not presently enjoy access to basic health care. A majority of these populations, despite recent urban migrations, is still rural-based. The quality of such health care and welfare services as are available to them is also often sub-standard. A large part of the current poor health/nutrition status of rural communities in Asia and Africa is traceable to this basic deficiency.

In order to achieve minimal acceptable standards of outreach and quality of basic health care major imbalances and deficiencies which currently beset our health systems need to be addressed. Some possible items on our agenda for this purpose are briefly considered here.

Community Organisation And Involvement

In all discussions on health care, lip-service to "community participation" notwithstanding, the real focus has always been on the "provider" – not the consumer. The assumption appears to be that the pattern of consumer-demand can be moulded and made to conform to the pattern of "supply" which is largely decided from the armchair. The highly centralised vertical programmes launched and pushed without prior consultations and dialogues with the community are based on this lopsided approach and are, for that very reason, floundering.

There is no built-in mechanism within our health systems for ensuring accountability and achievement-audit. As a result, in the health field today, there is a yawning gap between promise and performance, between inflated official claims on the one hand, and actual accomplishments as assessed by independent evaluations, on the other. Experience with the Family Planning programme, and more recently with the Immunisation Drive in India, bear ample testimony to this.

Accountability can only be ensured when a vigilant community becomes an active and informed participant in the system instead of remaining, as at present, an apathetic onlooker. Where the communities served are largely illiterate, poor and powerless, and are not actively involved in the formulation or implementation of programmes and services, they meekly accept (or reject) without complaint whatever is offered. They have no means of articulating and enforcing their demands and of thus contributing to the evolution and development of a meaningful health system which will answer their real needs.

There is, at present, a psychological divide between the provider and the consumer. The health service is largely perceived by the rural poor as a governmental bureaucratic operation to be availed of grudgingly and guardedly only in times of dire distress. It is not surprising, under the circumstances, that our health services are generally functioning well below their installed capacities. We need to initiate imaginative steps to bridge this gulf between the 'providers' and the 'consumers' of our health services.

Some concrete suggestions in this regard that I had earlier set out are (a) the setting up of a chain of *empowered representative* community organisations at the village and district levels which could individually and collectively represent the interests of 'consumers'; (b) the raising of voluntary "Health Brigades" of girls and boys in our villages after an initial period of basic training in elementary principles of personal and community health care, somewhat on the lines of the Scout movement; (c) the organisation of an imaginative programme of "Education for Better Living" and Vocational Training beamed to our rural girls, most of whom have dropped out of schools. It is through awakening our village communities, raising their levels of competence and self-esteem, and involving them as active participants in health-care operations that, not only better acceptance and outreach, but also better quality and standards of health services can be ensured. Health-care must become a people's movement and not continue to remain an inert bureaucratic operation.

Better Management Of Health Manpower And Material Resources

Present investments with respect to the health manpower infrastructure are

by no means unimpressive though they may not be considered wholly adequate. Far better returns for these investments than at present can be achieved through better deployment of existing personnel and resources, and through the removal of the several unnecessary bottlenecks which today hamper the smooth functioning of the system — in short, through better management. Health services are probably the worst-managed "public-service" activity in many developing countries.

To give just one example. Today the job description of the health workers includes "home visiting" – and there is convincing evidence from a number of studies that through a well-planned home-visiting programme undertaken by health workers and auxiliary nurse-midwives (ANMs), substantial reductions in maternal and infant mortality, and improvement in child health can be achieved; but within our health systems, we have not taken care to work out arrangements whereby truly meaningful and purposeful programmes of domiciliary visits can be carried out by health workers as part of routine primary health care.

In a village with a population of 1,000, there may be 200 houses. Out of these, there may be no more than 15 to 20 homes that may be considered to be "at risk", needing priority health care — such as, homes in which there is a pregnancy, a new birth, or an under-three child. If there is a system by which these "houses-at-risk" can be identified in advance and the health worker thus knows which houses she needs to visit as a priority, her "home-visiting" will cease to be the frustrating and futile "wandering" that it is at present; instead it will become a highly successful and rewarding operation. Village health guides and anganwadi (ICDS village-level) workers can be easily trained and entrusted with the task of maintaining a record system which will promote such a meaningful programme in most of our villages. Also, "planned" home visits, which can "capture" a large part of the village community, must be carried out on *appointed days* (of which the communities have advance notice) and at *regular intervals,* and not in an ad hoc haphazard fashion as at present.

In Indonesia, the unique system (Poy Sandu) whereby health workers from the centre converge on a specified village on an appointed day once a month to carry out such operations as growth-monitoring, immunisation, distribution of iron-folate tablets and vitamin A, has apparently yielded satisfactory results. This is an example well worth emulating.

The credibility of our health systems will also be greatly enhanced and there will be far better utilisation of their services if (a) arrangements for referral of cases requiring special treatment are improved; (b) if supplies of drugs to the centres are timely, regular and well-monitored; (c) if better arrangements for transport, and to and fro mobility of health staff from centre to sub-centre and to village could be forged; (d) if a good information system which provides for better communication between centres, sub-centres and villages can be worked out — which is not at all impossible in this electronic age, and (e) if each Primary Health Centre is staffed with a trained and motivated public relations officer (from a non-governmental voluntary agency) who can help establish and maintain good relations between the services and the consumers.

The budgetary allocation for drugs in our Primary Health Care Systems is inadequate; but what is worse, the distribution of drugs is also haphazard and ill-planned. There are periods, for example, when no iron-folate tablets or essential drugs are available at the centres, and there are periods of glut. All this indicates poor planning.

Before we argue for more health centres, more hospitals, more doctors and nurses, let us ensure that through proper management, we are making the best use of the existing facilities. In the absence of proper management procedures, more investment would only prove infructuous.

Better Inter-sectoral Functional Coordination

There is at present a plethora of rural development programmes in many African and Asian countries. According to conservative estimates, in each village in India, serving a population of about a thousand there are as many as eight to 10 functionaries belonging to different departments and agencies. There is hardly any attempt at coordinating their functions in a manner which would serve to mutually reinforce the respective programmes. In the absence of a vigilant community organisation to which they should have been normally answerable, the functionaries of the respective systems "look upwards" to their bosses in their own bureaucratic hierarchy. As a result, at present, several departments of the government have their own "small empires" reaching down to the village. Articulate and well-informed community organisations could certainly enforce some degree of coordination of programmes aimed at their upliftment.

The Potential Role Of ICDS And The Rural Schools

Two institutions in India which do not form part of the conventional health sector but which nevertheless can make significant contributions to rural health upliftment are: (1) the ICDS (Integrated Child Development Services) under the aegis of the Ministry of Social Welfare, and (2) the Rural School System (in the education sector).

The anganwadis (village outposts) of the ICDS should, in fact, function as village health outposts. The anganwadi should be the first port of call to the auxiliary nurse midwife or health worker (belonging to the health sector) when she visits the village; and all home visits should ideally be carried out jointly by the health worker and the anganwadi worker so that continuity in health care can be ensured. Through this arrangement, the outreach of the health system will greatly improve and home visits will become more meaningful and effective. The ICDS would also be greatly benefited and some of its present deficiencies, viz. failure to capture a high proportion of under-threes in the village, failure to provide adequate ante-natal care, etc., will be overcome.[3]

The several thousands of rural schools in India, and possibly in other Asian and African countries provide a readymade infrastructure. This can be imaginatively used for an expanded programme of rural health upliftment, not just beamed to the children alone but also to the village community at large as had been pointed out in an earlier publication of the Nutrition Foundation of India[4]. In fact, the rural school can become the focal point for a community health/nutrition education programme. Vast investments in primary education are not yielding full returns because (a) of the high drop-out rates, especially among girls, and (b) because of learning disabilities in children arising from undernutrition and chronic diseases[5]. A school health service will not only improve the health and nutritional status of children but will also reduce drop-outs

and contribute to the upgrading of the educational programme[6]. If the conventional health sector, the ICDS (of the social welfare sector) and the education sector could overcome their traditional inhibitions and could join together in an integrated programme of rural health upliftment, the rural health scene in the country will be truly transformed within the next decade.

Training And Motivation Of Workers

It is often rightly said that any system is only as good as the people working it. In the ultimate analysis, it is the level of training and the motivation of its workers that will determine the quality of the health services. Viewed from this angle, there is considerable scope and need for the improvement of the training programmes for our health workers.

The conventional view is that the major reason for the inadequacy in our rural health services is the fact that doctors are unwilling to go to the villages. The fashionable thing is to blame the doctors. While it will be desirable to encourage doctors to go to villages and to create the conditions which will enable them to do so, and which will make their movement to the villages worthwhile,the promotion of rural health in our country would call for strategies of a different kind.

There was a time, some 40 years ago, when the practice of medicine was not as heavily dependent on technology as it is today, and when a doctor could therefore have functioned just as well, and just as effectively, in a village as in a town. However, now, with all the recent technological advances, the quality of health care that a modern well-trained doctor can render in a town or a city with the diagnostic and therapeutic facilities which will be available to him, will be vastly different from the quality of health care which he can extend in a village. If, therefore, we are keen to send doctors to the villages, we must also ensure that the tools that they need to practise their vocation with proper skill are also made available in the villages. Unfortunately, we are now in no position to provide even basic technological tools at the village level.

It will be far more sensible, in the circumstances, to upgrade the training of the paramedical staff to a reasonable level where they can render the best medical and surgical aid possible in a rural setting; and to build a *good referral system* which will ensure that cases needing a higher order of health care get timely and prompt attention at the nearest health centre, well-equipped with modern diagnostic and therapeutic facilities. It is in view of these considerations that I had pleaded for the induction of a category of Health Scientists (B.Sc. in Health Science) well trained (in a three-year degree course) in preventive and promotive health care and in elementary medical, surgical and obstetric skills. The products of such training will be able to take care of the vast majority of common community ailments; they could be entrusted the major responsibility for the *first order* of health care, especially in the rural areas. Practitioners of indigenous systems of medicine, which command a great deal of faith in all our countries, have an important place in our health systems and can make significant contributions towards improving the outreach of basic health care to our rural masses.

However, in any arrangement for rural health care, it must be ensured that rural people do not end up with "second class" health care. It is for this reason that an efficient referral system is necessary. A referral system will have meaning only if the centres to which cases from rural areas are referred are really equipped with the most modern diagnostic and therapeutic facilities and are also staffed by specialists. There must, therefore, be a wide dispersal of modern medical technology and of modern medical manpower; the present near-exclusive concentration of these facilities in metropolitan towns and capital cities is regrettable. At least all our "taluk" and "peripheral" hospitals must be adequately equipped with the most modern technological tools and should be staffed with specialists before the end of the century.

The Need For A Balanced Approach To Health Care

The anxiety to achieve quick and spectacular results in some areas of health care often prompts the institution of vertical programmes – the so-called "Mission Approach" wherein a narrow set of objectives within the broad area of health care gets special attention. There was justification for such a Mission Approach, for instance, with respect to the Smallpox Eradication Programme which was a major "one-time effort" designed to totally eradicate a specific disease within a stipulated period. Such a Mission Approach would be totally out of place with respect to aspects of health care such as family planning and immunisation which need sustained effort and must remain an integral part of health care for a long time.

The danger in isolated vertical programmes is that while they may yield temporary success in specified fields, they tend to crowd out other important components of health care to positions of lower priority; and when the initial drive and enthusiasm wane, the achievements even in the specified fields progressively diminish. The Mission Approach is also often target-oriented; and, again, our experience with the family planning drive (sterilisations) and the immunisation drive has already shown that this could lead to undesirable aberrations and exaggarated claims.

It is important to resist the temptations for isolated "short-cuts" that may seem dramatic and yield short-term (political) gains. In the ultimate analysis, because of the mutually synergistic and reinforcing effects of its different components, an integrated programme of Primary Health Care will prove far more cost-effective than a series of simultaneous or sequential vertical programmes or paroxysmal outbursts of populist activity.

Sound health and good nutrition are, on the one hand, by-products of socio-economic development; on the other hand, they are also important determinants of the quality of human resources of a country and, therefore, of the pace and content of its socio-economic development. The subject of health care is, therefore, of a significance which extends far beyond the narrow confines of the health sector; and which, indeed, embraces the whole fabric of national development.

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