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## Editorial

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It gives me immense pleasure to write this editorial for Indian Journal on Growth, Development and Behavioral Pediatrics. In this issue I have included special articles on anxiety disorders, neuroplasticity, street children and substances abuse, developmental age and prediction of adult height counseling in behavioral problem, fetal growth – role of maternal nutrition, parents evaluation in developmental status (PEDS) and nutrition to as the key of the boost body defence.

With changing times in this competitive world children have become vulnerable to severe emotional disturbances that may manifest as anxiety. These problems are not clearly understood by their parents as well as pediatricians. Dr Nilesh Shah's article on anxiety disorders describes different types of presentation of anxiety in children. Counseling of behavioral problems written by Dr Madhusmita Sengupta will help is in this respect to acquire knowledge on counseing which is very much important and highly needed. Dr Neeta Naik has lucidly described the concept of neuroplasticity which is a relatively new knowledge. It is interesting to note that human brain has great potential to mould itself to the newer needs. This understanding is extremely important not only for treatment of developmental disorders but also for management of behavioral problems through thought process modification.

The problem of street children has never been considered seriously by the society in general and child health providers in particular. This is a group of children who are extremely vulnerable to growth, development and behavioral problems. Because they have run away from their homes they do not have their own identity. They live on the streets and do not have any shelter. They are constantly exposed to harsh natural environment such as heat, cold or rain and to antisocial elements in the society and have fear of the police. Due to lack of basic emotional needs of love, security and protection they become victims of substance abuse and behavioral problems. The article written by Dr Sunita Shanbhag throws light on some of the issues of street children.

Two important articles on nutrition have strengthend this issue. One on role of maternal nutrition on fetal growth by Dr Ranjana Chatterjee and Dr S P Goel and another on Nutrition as the key o boost bosy defence by Dr Pankaj Vohra. Both are very important articles in this issue. Lastly I must say few words in PEDS.

The present issue has portrayed the life of Dr Dilip Mukherjee in the field of study on growth. Every issue on IJGDBP highlight a distinct personality in

IJGDBP previously portrait of Dr Shanti Ghosh and Dr K n Agarwal were published and this time the editorial board feels honoured by printing Dr Dilip Mukherjee' contribution in this subspeciality. Dr Dilip Mukherjee, a stalwart in the field of growth and development has written very informative article on prediction of adult height. He has clearly described relationship between different measures of maturity and various equations for prediction. It is important for a pediatrician to understand the ways to predict adult height of a child for better management. Many a times parents are concerned about the child's final height and they can be counseled by the pediatrician with available knowledge on estimation of adult height.

Four important topics related to this (Growth, Development, Behavioral Pediatrics and Nutrition) are covered in this conference number of IJGDBP. Hope our readers will be benefitted by this topic.

I sincerely thank Dr Tapan Kr Ghosh and Dr Jaydeep Choudhury for giving me opportunity to communicate to all the readers of IJGDBP!

**Madhuri Kulkarni**  
*Editor of this Issue*

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#### **About the Editor of this Issue**

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Dr Madhuri Kulkarni is a Professor and Head of department of Pediatrics and Former Dean at L T M Medical College and L T M General Hospital, Mumbai. She completed her medical graduation and post graduation in Pediatrics at Seth G S Medical College, Mumbai. She joined as a lecturer in pediatrics at T N Medical College and subsequently worked as Associate Professor, Professor, Head of Department and In-charge Dean at L T M Medical College, Mumbai.

Besides the pediatric patient care, undergraduate and postgraduate teaching Dr Kulkarni was involved in many research projects related to developmental pediatrics, pediatric neurology and vaccinology. She actively participated as an investigator in Indiaclen's multicentric research projects.

Dr Kulkarni underwent training in 'Munich Developmental Testing' and 'Vojta's Kinesiology' to evaluate infants at risk for developmental disorders. In 1992 she was awarded international scholarship at Cleveland Clinic Foundation, Cleveland, USA. She also, underwent training in pediatric neurology at Hospital for Sick Children, Toronto, Canada. In 2003 she was awarded Fogarty scholarship in pediatric HIV at New York School of Medicine, New York, USA.

She has been one of the first few medical teachers to start training of undergraduate students in WHO – Unicef IMNCI strategy at its inception in India.

At L.T.M.G. Hospital, Dr Kulkarni started 'Early Intervention Clinic for developmentally subnormal children in 1985, 'Pediatric Neurology Clinic' in 1992 and 'Learning Disability Clinic' in 1996. The LD clinic is a unique multidisciplinary clinic authorized for certification for availing provisions in Maharashtra.

**Tapan Kr Ghosh, *Editor in Chief***

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## Anxiety Disorders in Children and Adolescents

**\*Nilesh Shah, \*\*Nanda Shah**

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Symptoms of anxiety are not very unusual in children and adolescents. Anxiety may be perceived as physical symptoms like palpitations, breathlessness and sweating as in panic disorder or it may be perceived as psychological symptoms (at emotional level) such as feeling nervous, frightened, embarrassed and apprehensive as in social anxiety disorder or it may be perceived at cognitive level, usually in adolescents, as excessive concern and worries as in generalised anxiety disorder.

Children can develop a variety of anxiety disorders such as overanxious disorder (generalized anxiety disorder), separation anxiety disorder, school phobia, social anxiety disorder (avoidant disorder) and elective mutism. Some anxiety disorders such as overanxious disorder and social anxiety disorder are seen frequently in clinical practice while the other disorders like school phobia and elective mutism are quite rare. The rate of generalized anxiety disorder in school-age children is estimated to be around 3%, the rate of social phobia is 1% , and the rate of simple phobia is 2.4%. The experience of anxiety has two components, the awareness of the physical sensations, (such as palpitations and sweating), and the

awareness of psychological sensations, of being nervous and frightened. The experience of severe anxiety affects thinking, perception and learning.

In younger children the symptoms of anxiety are more psychological and manifests in the form of unusual behavior like refusing to separate from parents or avoidance of new interpersonal contacts. In older children and adolescents, the symptoms of anxiety may be more at cognitive level like excessive concern and worries.

### **Overanxious Disorder (Generalized Anxiety Disorder)**

Children and adolescents suffering from overanxious disorder have excessive tendency to worry about variety of things such as examinations, potential injuries, friendships and group acceptance. They are overburdened with ruminative concern about competence and performance. These children have perfectionist standards. They are dependent on the evaluation of others and feel rejected easily. They are usually described as very obedient and conforming children. Anxiety symptoms like difficulty in falling asleep and various somatic symptoms like headache, sore throat, difficulty in breathing, vomiting are common in these children as they

have anticipatory anxiety about forthcoming events. Individual psychotherapy and judicious use of anti-anxiety medications have been found to be very useful in this disorder particularly when there are physical symptoms of anxiety and insomnia. Due to great motivation to please and high level of understanding ability, these children usually do exceedingly well in psychotherapy.

### **Avoidant Disorder (Social Anxiety Disorder)**

Social anxiety disorder seems to be more frequent in girls. Children and adolescents suffering from social anxiety disorder experience age inappropriate anxiety in social situation and for strangers. They are very shy, remain aloof, and avoid social encounters. But in their homes and with those with whom they are familiar, they do not show any embarrassment and behave with adequate amount of boldness. They may exhibit clinging and overly demanding behaviour at home but in the social situations they try to remain inconspicuous, often talking in whispers and hiding behind people. They find it difficult to relate with the children of the opposite sex. They shrink from participation in competitive activities and do not take the initiative or lead in any activity in spite of having an intense desire to do so. When forced or coaxed into social situations, these children may feel very embarrassed and tearful. Children with this disorder may not reach

their educational potential unless they are given proper support. Sometimes, in contrast to their outward behaviour, they may be harbouring very grandiose fantasies and high aspirations. It is very essential to remember that these children should not be forced to socialize but should be allowed to take their own time to feel comfortable and socialize. The treatment of this disorder is directed to help these children increase assertiveness in social situations. Appreciations and encouragement aid in the process of developing assertiveness. Anti-anxiety and antidepressant drugs may be used when indicated.

### **Separation Anxiety Disorder**

In this disorder the child is reluctant to separate from his mother, father or a close familiar person and the intensity of the reaction to separation is out of keeping with his developmental age. It is common in children in the age group of 3-6 years. It occurs in boys as well as girls. The estimated prevalence of this disorder is around 3 to 4 percent of all school-age children. The most well recognized expression of this disorder is refusal to go to school or insisting on mother sitting with him in the class. If the child is forcibly separated and sent to school he may develop various somatic symptoms like pain in abdomen, vomiting or headache. He may also refuse to separate from his mother in other situations like while going to a park or to a friend's house.

He insists on sleeping with his parents and is reluctant to sleep alone in his room. It is important to recognize this disorder and make parents and teachers aware about this disorder. To help the child having separation anxiety disorder, one may have to plan a gradual separation from his mother. Initially it may be a good idea to allow his mother to sit with the child in the class. Once the child develops the trust that the mother is not going to leave him alone in the class and go away, (which may sometime take a couple of weeks to a couple of months), she may sit outside the classroom and child may be allowed to go out and meet her as and when he wants. Gradually then, the mother may go out of the school for a while (for a few minutes at a time) after taking the child into confidence. Finally, once the child is found to be ready for separation, the mother may go home after leaving him in school and may come back to pick him up when the school is over. The whole process of separation should be carried out very patiently and in a very non-threatening manner as it may take a couple of months or more for the child to sit comfortably in his class.

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## Developmental Age and Prediction of Adult Height

**Dilip Mukherjee**

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Growth and development is a continuous process from fertilization till maturity. Besides genetic factors, growth is influenced by nutrition, illness, social and economic and psychological environment. Growth is a measurable index of health. The study of growth is of paramount importance in pediatrics. A pediatrician needs to be well versed with the knowledge and practice of measurement of growth and its proper assessment to enable him to find out if the child is growing adequately or not in reference to individual performance capability and also the community.

The basic need in studying growth is to know and use appropriate, scientifically sound and statistically relevant methods. If methods are not identical, it becomes impossible to compare and understand the difference of performance of different children with regard to national and international reference standards.

The assessment of the developmental age and prediction of adult height of children form an interesting aspect of growth and development. Pediatricians are therefore, required to be abreast with the knowledge so that they can answer the queries of the parents regarding these.

### **Developmental Age**

We need to measure the development age or physiological maturity applicable throughout the whole period of growth. There are widely variable measures which meet the criterion in whole or in part. Ranking from dental developmental landmarks to the water content of muscle cells, these various developmental 'age' scales do not coincide and each has its particular use. However bone age or skeletal maturity assessment, dental maturity and 'shape age' by far are the most generally useful methods.

### **Shape Age :**

As the different parts of the body grow and develop at different rates, a child's shape changes as he grows older. The legs and arms look relatively smaller compared to the trunk and facial growth. The degree of shape change can be conveniently devised into a measure of developmental maturity. The devise ideally should be made independent of the final 'shape' reached, otherwise it would be subject to criticism as for height age. To find such a measure is a mathematically complex and difficult task and unfortunately has not yet been

accomplished.

**Decimal age:**

While working on data concerning growth, especially in the calculation of growth velocities, it is felt that the conventional age in month or years is cumbersome to work with (especially so in cases of subtraction of one data from another to know the age difference). A newer system expressing age in terms of decimals or tenths of a year is much more convenient.

Table 1 shows the values attributed to different dates on a calendar. These have been calculated by expressing 365 days in equivalents of hundreds. For example 1st January has a value of 000 while 19th February has a value of 134. To calculate the decimal age, the following is done – the year of birth (eg, 1989) is recorded for the last 2 digits as 89. The decimal will follow this. Beyond the decimal, the next three digits represent the day of the year (for eg, 18th March as 208). Thus for a child born on 18th March 1989, his birth date in decimal years will be 89.208. Likewise the date on 14th December 1996 will be 96.951. Thus on 14th December 96, his age will be  $96.951 - 89.208 = 7.743$  decimal years. The growth velocity can then be easily calculated by dividing the increment of height by increment of age. (Table 1).

**Relationship between Different Measures of Maturity**

Children tend to be either consistently advanced or retarded in maturity during

their whole process of growth or at any age after age 3. Thus girls with an early menarche are skeletally advanced and continue to mature faster. Dental maturity partly shares in this general skeletal and bodily maturation. Girls on an average have more number of teeth erupted than boys. At age 6 to 13 years, the skeletally advanced children have on an average more number of teeth erupted than those who are skeletally retarded. Similarly those who have an early adolescence on an average are found to have early eruption of teeth. This relationship however is not very much interrelated and interdependent, as both the dental development and skeletal development have their own independence in growing mature.

It is evident that there are some general factors of maturity throughout the growth period, thus making a child advanced or retarded as a whole in skeletal ossification, in final size attainment, permanent dentition, psychological reactions and IQ test results. However it is likewise to use such measure of maturity to draw conclusions regarding growth in general. Set under this general tendency are groups of more limited maturation which have independent growth of one another. These are dentition (primary and secondary), centers of ossification and brain growth. Some of the mechanisms behind the maturational processes are more evident in hypothyroid states where tooth eruption, skeletal maturation and

brain growth are all retarded. In contrast, without any effect on dentition or in precocious puberty, there are progression of organization of the brain. advanced skeletal and genital maturity

Table 1. Table of decimals of year

	1 Jan	2 Feb	3 Mar	4 Apr	5 May	6 June	7 July	8 Aug	9 Sept	10 Oct	11 Nov	12 Dec
1	000	085	162	247	339	414	496	581	666	748	833	915
2	003	088	164	249	332	416	499	584	668	751	836	918
3	005	090	167	252	334	419	501	586	671	753	838	921
4	008	093	170	255	337	422	504	589	674	756	841	923
5	011	096	173	258	340	425	507	592	677	759	844	926
6	014	099	175	260	342	427	510	595	679	762	847	929
7	016	101	178	263	345	430	512	597	682	764	849	932
8	019	104	181	266	348	433	515	600	685	767	852	934
9	022	107	184	268	351	436	518	603	688	770	855	937
10	025	110	186	271	353	438	521	605	690	773	858	940
11	027	112	189	274	356	441	523	608	693	775	860	942
12	030	115	192	277	359	444	526	611	696	778	863	945
13	033	118	195	279	362	447	529	614	699	781	866	948
14	036	121	197	282	364	449	532	616	701	784	868	951
15	038	123	200	285	367	452	534	619	704	786	871	953
16	041	126	203	288	370	455	537	622	707	789	874	956
17	044	129	205	290	373	458	540	625	710	792	877	959
18	047	132	208	293	375	460	542	627	712	795	879	962
19	049	134	211	296	378	463	545	630	715	797	882	964
20	052	137	214	299	381	466	548	633	718	800	885	967
21.	055	140	21>6	301	384	468	551	636	721	803	888	970
22	058	142	219	304	386	471	553	638	723	805	890	973
23	060	145	222	307	389	474	556	641	726	808	893	975
24	063	148	225	310	392	477	559	644	729	811	896	978
25	066	151	227	312	395	479	562	647	731	814	899	981
26	068	153	230	315	397	482	564	649	734	816	901	984
27	071	156	233	318	400	485	567	652	737	819	904	986
28	074	159	236	321	403	488	570	655	740	822	907	989
29	077		238	323	405	490	573	658	742	825	910	992
30	079		241	326	408	493	575	660	745	827	912	995
31	082			244		411	578	663		830		997

## **Sex Differences in Development Age Prediction of Adult Height**

Girls are found to be ahead of boys in skeletal maturation and subcutaneous fat thickness and in the maturity of permanent dentition all throughout. It would seem that the sex differences lies in the general maturity. Girls are usually ahead of boys in motor development and also in certain forms of aptitude tests.

The skeletal age difference begins during fetal life, the male retardation being due probably to the action of genes carried on the Y chromosome as children with XXY (Klinefelter syndromes) have skeletal maturity indistinguishable from the normal XY male and children with XO (Turner's syndrome) have skeletal maturity approximately equal to normal female XX, at least until puberty. At birth boys are about 4 weeks behind girls in skeletal age, and from then till adulthood they remain at about 80% of skeletal age of girls of the same chronological age. The difference in percentage of dental age is not so great, boys during the period of permanent dentition being about 95 per cent of the dental age of girls.

The sex difference is not precisely the same for all bones and not for all teeth. There are sex bone and sex teeth interactions. Thus in girls permanent canines erupt on average 11 month earlier than the boys; while the first molars erupt only 2 months earlier. Similar effects are noted in the skeletal ossification in knees and elbows.

### **Target height :**

Every child has a certain growth potential that is genetically inherited. A child of tall parents will be tall whereas a child of relatively short parents is likely to be on the smaller centiles in height. This concept is utilized in the calculation of mid-parental height (MPH) and target centile range (TCR). The TCR gives an estimate of the child's growth trajectory. However one must remember that the TCR is based on western standards and are unlikely to have the same accuracy in the Indian population. It is important that we address the calculation of target height using local normative data.

### **Bone age :**

The maturational age of the child is not always dependent on the chronological age. More often than not, it is the maturational age that determines the tempo of growth and puberty. Bone age determination is the only quantitative method available that can provide a measure for tempo. Bone age is usually assessed by the Tanner Whitehouse (TW)<sup>1</sup> or Greulich and Pyle (GP)<sup>2</sup> methods. A third and more recent method is also available, called the Oostdijk method. This Dutch method is a modification of the Greulich and Pyle method in that there are scores for the radius, ulna, phalanges and carpal bones.

### **Prediction equations :**

Several prediction models have been

published that calculate predicted adult height using the variables of sex, age, height, bone age and parental target height. The Bayley Pinneau<sup>3</sup> method uses the Greulich and Pyle bone age estimation. The TW2 bone age is based on the RUS bone age in three prediction models of increasing complexity. The absence or presence of menarche and the age at menarche are also factored in independently in the TW model. The de Waal prediction<sup>4</sup> is meant primarily for children with tall stature. A model to calculate height velocity in children with idiopathic short stature is also available. The table below gives the variables used for the individual prediction equations.

1. *Bayley-Pinneau*
  - a. Chronological age
  - b. Sex
  - c. Height
  - d. Bone age – GP/Oostdijk
2. *Tanner-Whitehouse (3 variables)*
  - a. Chronological age
  - b. Sex
  - c. Height
  - d. TW bone age
3. *Tanner-Whitehouse (4 variables)*
  - a. Chronological age
  - b. Sex
  - c. Height
  - d. TW2 bone age
  - e. Height one year prior to radiograph
4. *Tanner-Whitehouse (5 variables)*
  - a. Chronological age
  - b. Sex
  - c. Height
  - d. TW2 bone age
  - e. Height one year prior to radiograph
  - f. TW2 bone age one year prior to current bone age X ray
5. *de Waal (Tall stature)*
  - a. Chronological age
  - b. Sex
  - c. Height
  - d. Bone age – GP/Oostdijk
  - e. Target height
6. *Idiopathic short stature (result given - height velocity in cm/year)*
  - a. Chronological age
  - b. Sex
  - c. Birth related information – gestational age, birth weight
  - d. Measurements – height, weight
  - e. Parent information – father's height, mother's height
  - f. Growth hormone (GH) information – GH dose (IU/kg/week), maximum GH response to stimulation (mcg/l)

It must be remembered that all such prediction models conform to western standards and their use in the Indian context should be considered with a degree of skepticism. Further these models are only estimates and will have

very naturally a degree of error. Finally prediction equations do not take into account life events during the course of

a child's growth, for example an episode of malnutrition or prolonged illness or psychosocial deprivation.

1. Greulich WW, Pyle SI. Radiographic Atlas of Skeletal Development of the Hand and Wrist. 2nd ed. Stanford, California: Stanford University Press, 1959.
  2. Tanner JM, Whitehouse RH, Healy MJR. A new system for skeletal maturity from the hand and wrist, with standards derived from a study of 2600 healthy British children Part I & II. Paris Centre International de L'Entance, 1962.
  3. Bayley N, Pinneau S. Tables for predicting adult height from skeletal age: revised for use with the Greulich and Pyle hand standards. *J Pediatr* 1952;**40**:432-41.
  4. de Waal WJ, Greyn-Fokker MH, Stijnen T, van Gurp EA, Toolens AM, de Muinck Kaiser-Schrama SMPF, Aarsen RSR, Drop SLS. Accuracy of final height prediction and growth-reductive therapy in 362 constitutionally tall children. *J Clin Endocrinol Metab* 1996;**81**:1206-61.
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## Neuroplasticity

**Neeta Naik**

*Consultant in Pediatric Epilepsy and Developmental Disabilities, Division of Pediatric Neurology, L.T.M.G Hospital Mumbai.*

The human brain is malleable in response to environment and life experience. This is true not just for growing children but throughout life. Stimulating environments lead to expanded cortical areas, greater neural organization, more branching of neurons and increased rates of neuronal survival. Multiple studies have demonstrated that the environment can and does have a profound influence on brain development. Animals raised in rich, stimulating environments have more dendritic branching and synapses per neuron than animals without this stimulation. In contrast, organisms placed at a young age in stimulus deprived environments, exposed to significant trauma or caretaker neglect suffer neurologically. Under-stimulating environments can and do cause less neuronal branching, less neurogenesis and neuronal loss. Cognitive stimulation at any age is an important predictor of enhancement and maintenance of cognitive functioning. Physical and mental exercise can increase levels of neurotrophic and other growth factors stimulate neurogenesis, increase resistance to insult and improve mental performance. Conversely an impoverished environment appears to lead to detrimental effects on the organism. At

one time it was thought that the brains of young children may be more capable of recovery following injury because they were less developed, in particular less specified in the relationship of brain structure to cognitive or behavioral functioning. Canadian psychiatrist Norman Doidge has in fact stated that neuroplasticity is “one of the most extraordinary discoveries of the twentieth century<sup>1</sup>.”

### **Definition of neuroplasticity**

Neuroplasticity is referred to as brain plasticity, cortical plasticity or cortical re-mapping refers to the changes that occur in the organization of the brain as a result of experience or the brain's ability to reorganize itself by forming new neural connections throughout life. Neuroplasticity allows the neurons (nerve cells) in the brain to compensate for injury and disease and to adjust their activities in response to new situations or to changes in their environment. The concept of neuroplasticity pushes the boundaries of the brain areas that are still re-wiring in response to changes in environment.

### **Critical Period**

At birth the brain is very immature. In fact, the human brain is not fully mature until at least last twenty years after birth.

During this period the human brain is highly dependent and is modified and shaped by experience. For example in the people born blind, the parts of brain that normally process visual information are rewired and come to process sounds, including language whereas those born deaf the areas of the brain that normally process sounds come to process vision<sup>2</sup>.

The plasticity of the brain is also maximal during critical period. This is the maturational time period during which some crucial experience will have its peak effect on development or learning during which normal behavior attuned to a particular environment to which the organism has been exposed. The experience will have a reduced effect after critical time period. Hubel and Wiesel had demonstrated that ocular dominance columns in the lowest neocortical visual area, V1, were largely immutable after the critical period in development. The critical period for development of the visual cortex in children is upto 7 years<sup>3</sup>. Critical periods also were studied with respect to language; the resulting data suggested that sensory pathways were fixed after the critical period; which is 6 years for language acquisition is 6 years. The innate ability for language acquisition declines gradually upto 2 years and reduces dramatically after 12 years<sup>2, 4</sup>.

Environmental changes could alter behavior and cognition by modifying connections between existing neurons

and via neurogenesis in the hippocampus and other parts of the brain, including the cerebellum. According to the theory of neuroplasticity, thinking, learning, and acting actually change both the brain's physical structure, or anatomy, and functional organization, or physiology from top to bottom<sup>5</sup>. Neuroscientists are presently engaged in a reconciliation of critical period studies demonstrating the immutability of the brain after development.

#### ***Mechanisms of neuroplasticity:***

1. *Axonal sprouting* – Brain reorganization takes place by mechanisms such as “axonal sprouting” in which undamaged axons grow new nerve endings to reconnect neurons whose links were injured or severed. Undamaged axons can also sprout nerve endings and connect with other undamaged nerve cells, forming new neural pathways to accomplish a needed function. For example, if one hemisphere of the brain is damaged, the intact hemisphere may take over some of its functions. The brain compensates for damage in effect by reorganizing and forming new connections between intact neurons. In order to reconnect, the neurons need to be stimulated through activity.

2. *Synaptic pruning: Developmental plasticity* – Gopnick *et al* (1999) describe neurons as growing telephone wires that communicate with one another. Following birth, the brain of a new-

born is flooded with information from the baby's sense organs. This sensory information must somehow make it back to the brain where it can be processed. To do so, nerve cells must make connections with one another, transmitting the impulses to the brain. Continuing with the telephone wire analogy, like the basic telephone trunk lines strung between cities, the newborn's genes instruct the "pathway" to the correct area of the brain from a particular nerve cell. For example, nerve cells in the retina of the eye send impulses to the primary visual area in the occipital lobe of the brain and not to the area of language production (Wernicke's area) in the left posterior temporal lobe. The basic trunk lines have been established, but the specific connections from one house to another require additional signals. Over the first few years of life, the brain grows rapidly. As each neuron matures, it sends out multiple branches (axons, which send information out, and dendrites, which take in information), increasing the number of synaptic contacts and laying the specific connections from house to house, or in the case of the brain, from neuron to neuron. At birth, each neuron in the cerebral cortex has approximately 2,500 synapses. By the time an infant is two or three years old, the number of synapses is approximately 15,000 synapses per neuron (Gopnick, *et al.*, 1999). This amount is about twice that of the average adult brain. As we age, old connections are deleted through a

process called synaptic pruning.

Synaptic pruning eliminates weaker synaptic contacts while stronger connections are kept and strengthened. Experience determines which connections will be strengthened and which will be pruned; connections that have been activated most frequently are preserved. Neurons must have a purpose to survive. Without a purpose, neurons die through a process called apoptosis in which neurons that do not receive or transmit information become damaged and die. Ineffective or weak connections are "pruned" in much the same way a gardener would prune a tree or bush, giving the plant the desired shape. It is plasticity that enables the process of developing and pruning connections, allowing the brain to adapt itself to its environment.

#### ***Cellular and molecular basis of plasticity***<sup>6</sup>:

The excitatory neurotransmitter glutamate plays a vital role in the concept of Neuroplasticity. The post synaptic neurons have AMPA receptors and NMDA receptors. Glutamate activates AMPA receptors, which opens the NA ionic channel linked to it and causes localized depolarization. The depolarization causes the entry of Ca ions through the NMDA receptors which then starts a signaling cascade and release of trophic factors and activation of gene transcription in the nucleus that support synaptic

connections. Persistent and coincident firing of neurons is essential for the entry of Ca ions and the signaling cascade activation.

The function of immature NMDA receptor is enhanced in the postnatal period which explains the greater plasticity of the brain in this period. Thus with every new experience, the brain slightly rewires its physical structure and this rewiring is mediated through the signaling cascade. Studies at the molecular level reveal that the chemistry of DNA can be changed by experience in ways that affect the expression of our genes. Moreover, such effect on the chemistry of DNA can be produced by social experience, which in turn modifies gene expression in ways that can persist for the duration of a lifetime.

Experience alters neural development in at least three different ways: (i) By influencing gene expression, (ii) by influencing the release of neurotrophins and (iii) by influencing the release of neurotransmitters like norepinephrine that play a role in normal development.

At the macro level of the brain system, research demonstrates how sensory, perceptual and language functions are modified by experience and how the neural systems that underlies these complex behaviors are transformed through experimental alterations that occur early in life.

## **Types of Plasticity**

### ***Developmental plasticity or plasticity in childhood:***

The first, developmental plasticity reflects the shaping of the brain by early life experience. Children have more neurons and synapses than adults but lose a significant number of neurons and synapses through their adolescent years through a normal pruning process. Neuronal networks that are not sufficiently used are eliminated. Those frequently used are expanded and interconnected. Early plasticity may be greatest because many synapses and neurons have not yet been pruned.

Developmental plasticity can be divided in four types<sup>2</sup>. The four types are adaptive, impaired, excessive and plasticity which make the brain vulnerable to injury. Adaptive plasticity means change in neuronal circuitry that enhances a special skill with practice allowing the brain to adapt or compensate for injuries or change in sensory output. Acquired amblyopia due to strabismus is the example of the same.

Impaired plasticity refers to situation in which genetic or acquired disorders disrupt the molecular plasticity pathways. This leads to disordered transcription as seen in cases like fragile X syndrome, Coffin- Lowry syndrome or Rhetts syndrome.

Excessive plasticity in the developing brain can lead to disability through reorganization of new maladaptive neuronal circuits that cause neurological disorders like focal dystonia or mesial temporal sclerosis.

***Activity dependent plasticity or the plasticity of learning and memory:***

Activity dependent plasticity reflects pattern by which years of practice combined with learning and memory form new connections through experience and knowledge acquisition<sup>7</sup>. Any individual competent in an activity from athletics to a specific vocation relies on this type of plasticity.

It was once believed that as we aged, the brain's networks became fixed. In the past two decades, however, an enormous amount of research has revealed that the brain never stops changing and adjusting. Learning, as defined by Tortora and Grabowski (1996), is "the ability to acquire new knowledge or skills through instruction or experience. Memory is the process by which that knowledge is retained over time." The capacity of the brain to change with learning is plasticity. So how does the brain change with learning? According to Durbach (2000), there appear to be at least two types of modifications that occur in the brain with learning:

1. A change in the internal structure of the neurons, the most notable being in the area of synapses.
2. An increase in the number of synapses between neurons.

Initially, newly learned data are "stored" in short-term memory, which is a temporary ability to recall a few pieces of information. Some evidence supports the concept that short-term memory depends upon electrical and chemical events in the brain as opposed to structural changes such as the formation of new synapses. One theory of short-term memory states that memories may be caused by "reverberating" neuronal circuits – that is, an incoming nerve impulse stimulates the first neuron which stimulates the second, and so on, with branches from the second neuron synapsing with the first. After a period of time, information may be moved into a more permanent type of memory, long-term memory, which is the result of anatomical or biochemical changes that occur in the brain (Tortora and Grabowski, 1996).

***Injury-induced plasticity: plasticity and brain repair :***

During brain repair following injury, plastic changes are geared towards maximizing function in spite of the damaged brain. In studies involving rats in which one area of the brain was damaged, brain cells surrounding the damaged area underwent changes in their function and shape that allowed them to take on the functions of the damaged cells. Although this phenomenon has not been widely studied in humans, data indicate that similar (though less effective) changes occur in human brains following injury. This type of plasticity has been traditionally thought to operate more

robustly in young brains. Defined as the Kennard Principle, this principle argues that recovery from a focal lesion to the brain is superior if the lesion occurs early in development rather than during adulthood. This concept also referred to as vicariation suggests that developing, immature central nervous systems have back-up neuronal connections, networks and fiber tracts that participate in the takeover of lost functions post brain injury. The concept of equipotentiality suggests that areas not normally involved in controlling certain types of behavior or function can take over those functions under the right circumstances. In mature brains, certain fiber tracts may become “unmasked” and functional following a brain injury. However, plasticity may not be without cost for the young brain. Increased plasticity of the young brain may allow it to compensate for one impairment but this may be at the expense of another, later developing function. A surprising consequence of neuroplasticity is that the brain activity associated with a given function can move to a different location not only as a result of normal experience but also occurs in the process of recovery from brain injury<sup>8</sup>. The adult brain is not “hard-wired” with fixed and immutable neuronal circuits. There are many instances of cortical and subcortical rewiring of neuronal circuits in response to training as well as in response to injury. There is solid evidence that neurogenesis, the formation of new nerve cells, occurs in the adult, mammalian brain—and such changes can persist well into old age.[10] The evidence for neurogenesis

is mainly restricted to the hippocampus and olfactory bulb, but current research has revealed that other parts of the brain, including the cerebellum, may be involved as well. In the rest of the brain, neurons can die, but they cannot be created. However, there is now ample evidence for the active, experience-dependent re-organization of the synaptic networks of the brain involving multiple interrelated structures including the cerebral cortex. The specific details of how this process occurs at the molecular and ultrastructural levels are topics of active neuroscience research. The manner in which experience can influence the synaptic organization of the brain is also the basis for a number of theories of brain function including the general theory of mind and epistemology referred to as Neural Darwinism and developed by immunologist Nobel laureate Gerald Edelman. The concept of neuroplasticity is also central to theories of memory and learning that are associated with experience-driven alteration of synaptic structure and function in studies of classical conditioning in invertebrate animal models such as *Aplysia*. This latter program of neuroscience research has emanated from the ground-breaking work of another Nobel laureate, Eric Kandel, and his colleagues at Columbia University College of Physicians and Surgeons.

#### ***Brain plasticity and cortical maps :***

Cortical organization, especially for the sensory systems, is often described in terms of maps (or homunculus). In the

late 1970s and early 1980s, several groups began exploring the impacts of removing portions of the sensory inputs. Michael Merzenich and Jon Kaas used the cortical map as their dependent variable<sup>9</sup>. They found – and this has been since corroborated by a wide range of labs – that if the cortical map is deprived of its input it will become activated at a later time in response to other, usually adjacent inputs. At least in the somatic sensory system, in which this phenomenon has been most thoroughly investigated, JT Wall and J Xu have traced the mechanisms underlying this plasticity. Re-organization is not cortically emergent, but occurs at every level in the processing hierarchy; this produces the map changes observed in the cerebral cortex.

Merzenich and DT Blake (2002, 2005, and 2006) went on to use cortical implants to study the evolution of plasticity in both the somatosensory and auditory systems. Both systems show similar changes with respect to behavior. When a stimulus is cognitively associated with reinforcement, its cortical representation is strengthened and enlarged. In some cases, cortical representations can increase two to three fold in 1-2 days at the time at which a new sensory motor behavior is first acquired, and changes are largely finished within at most a few weeks. Control studies show that these changes are not caused by sensory experience alone: they require learning about the sensory experience, and are strongest for the stimuli that are associated with reward, and occur with

equal ease in operant and classical conditioning behaviors.

***Clinical application of the concept of neuroplasticity:***

*Treatment of brain damage* – After brain injury, post-synaptic neurons attempt to adjust to reduced stimulation through several processes, including forming more receptors, slower re-uptake and receptor dysregulation. This pattern of hypersensitivity makes nerve cells more sensitive to incoming stimulation, particularly pain. However, brain injury alone may not be the only cause of decreased functioning. Depression and chronic stress result in elevated glucocorticoid levels in humans which can over long periods cause premature aging as measured by atrophy in the hippocampus of the brain.

The once held belief that recovery from brain injury is limited to the first one to two years following injury has now been met with considerable challenge. Further, the idea that remediation of function can only be accomplished in the first eighteen months post accident is increasingly being challenged. The idea that the development of compensatory strategies many years post accident leading to improved daily functioning may have no direct impact on the structure and biochemistry of the brain is also increasingly in question. Neuroplasticity research suggests that people can recover for many years but on a continuum such that recovery is easier and faster early on and becomes increasingly more difficult as time progresses. A significant number of

studies have now demonstrated that many people can make significant physical, cognitive and behavioral recovery as long as five years or more post brain injury. As Stein noted in 1995, "There is no rule of neuroscience that the processes of functional recovery must occur rapidly or that treatment should be terminated after a fixed period of time because the early results are unsatisfactory."

Neuro-rehabilitative therapy, in particular cognitive rehabilitation, may well facilitate the brain's plasticity. This theory has been demonstrated not only from the patient's perspective and observations of others, but even through SPECT and PET scanning. It also appears that neuro re-organization can be enhanced through specific training. Though compensatory strategies can be helpful post brain injury, plasticity research suggests that the appropriate timing of teaching these strategies is a critical and complex issue. If strategies are implemented too early, those potentially available, compensatory parts of the brain may not be capable of effectively taking over function. This may explain the significant problems many mild to low moderate brain injured patients experience when they return, often within a few days post injury, to every day activities, particularly work. Thus, too much activity too early post injury may lead to increased adverse outcome.

***Thoughts, emotions and neuro-plasticity***<sup>10</sup> :

The Dalai Lama invited Richard Davidson, a Harvard-trained neuro-

scientist at the University of Wisconsin-Madison's W.M. Keck Laboratory for Functional Brain Imaging and Behavior to his home in Dharamsala, India, in 1992 after learning about Davidson's innovative research into the neuroscience of emotions. Could the simple act of thinking change the brain? Most scientists believed this idea to be false, but they agreed to test the theory. One such experiment involved a group of eight Buddhist monk adepts and ten volunteers who had been trained in meditation for one week in Davidson's lab. All the people tested were told to meditate on compassion and love. Two of the controls, and all of the monks, experienced an increase in the number of gamma waves in their brain during meditation. As soon as they stopped meditating, the volunteers' gamma wave production returned to normal, while the monks, who had meditated on compassion for more than 10,000 hours in order to attain the rank of adept, did not experience a decrease to normal in the gamma wave production after they stopped meditating. The synchronized gamma wave area of the monks' brains during meditation on love and compassion was found to be larger than that corresponding activation of the volunteers' brains.

The "nature-nurture" debate, is essentially an argument of the relative importance of genetic versus environmental in the definition of individual differences among members of the same species. It is also an argument that is based on a fundamental misunderstanding of cell biology, for

adherents commonly ignore the simple fact that neither genes nor experience can influence development independent of context. Experience requires translation through processes associated with bodily function that commonly includes brain activation. Such functions are inevitably influenced by the genome. Likewise, genes operate within cells, the activity of which is constantly regulated by external events. Alas, gene and experience are inseparable. The nucleotide sequences that comprise the genome exist within a dynamic context that is constantly subject to modification.

Over the past 30 years, developmental, personality, and social psychologists have been extending and testing attachment theory, a psychological theory first proposed in the 1960s and 70s by John Bowlby, a British psychiatrist, and Mary Ainsworth, an American developmental psychologist. The theory, rooted in both psychoanalytic psychiatry and primate ethology, deals with what Bowlby and Ainsworth called "attachment" (or emotional bonding) between infants and their primary caregivers. Depending on parental sensitivity and responsiveness (or insensitivity and unresponsiveness) to an infant's distress signals, children can become relatively securely or insecurely attached to their primary caregivers, and if insecurely attached, can exhibit anxious, avoidant, or disorganized attachment behavior. The pattern of insecurity displayed during infancy has been shown to persist in many cases over periods of years, with

continuing effects on mental health and success or failure in close personal relationships. Despite the tendency toward persistence, developmental and clinical researchers have successfully designed early intervention techniques to increase children's sense of security.

This attachment theory is being applied to the study of adolescents' and adults' mental health and close relationships, such as friendship, romantic love, and marriage. It is possible to activate the attachment behavioral system" experimentally, increasing a person's sense of security by both conscious and unconscious means. By showing that a person's "attachment style" (ie, his or her characteristic pattern of security or insecurity) can be modified experimentally, it is possible to alter personality in the direction of increased security, even during adulthood.

Besides postulating the existence of an attachment behavioral system, an idea that has now been extensively researched, the caregiving system, which is most evident in parental sensitivity and responsiveness to young children, is the one that responds generally to other people's needs and distress. Theoretically, therefore, it is the locus and source of compassion.

Our emotional reactions to events and our daily mood form the basis of our personality and color virtually all our behavior. Adult personality is traditionally regarded as relatively fixed and immutable. Research over the past decade on the brain mechanisms that subserve emotion and individual

differences in emotional reactivity that we call affective style, have provided a new avenue to explore the possibility of emotional transformation in light of brain plasticity. Rather than being conceptualized as a fixed trait, affective style is regarded as a trainable skill. Evidence that exposure to adversity can actually help to cultivate resilience will be presented. One of the specific characteristics that can be learned is emotion regulation. Even very short-term training in emotion regulation can produce demonstrable effects on brain function. The concept of Neuroplasticity therefore has a significant role in

understanding and advancing the management of various psychiatric disorders like depression, anxiety, schizophrenia and addictions.

### Conclusion

Neuroplasticity refers to a range of neuronal changes including cellular and molecular mechanisms & formation or reorganization of neurons leading to alteration in brain structure and function in response to experience. This concept allows us to be optimistic about neurological and psychological recovery from disorders which once were thought permanent.

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## Street Children and Substance Abuse

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Care of the child is primarily the responsibility of parents. In traditional India, the child in need of care and protection was looked after in the joint family, caste group, village community, and religious institutions. As a result of rapid urbanization and industrialization, breakdown of family structures and population explosion, prospects of adventure and excitement in cities, the conditions of children all over the world have rapidly deteriorated. The most worrisome result is that they are quite frequently deprived of their basic rights to family care, protection, shelter, food, health, and education.

This phenomenon of 'Street Children' is not limited to any particular country; in fact, it is a world-wide social reality. Street children are referred by varied names all over the world. In the developed North, they are labeled "homeless youth", "runaways" or even "throwaways". In developing countries, they are called "parking boys" (Kenya), "pogey boys" (Philippines), "pivetes" (Brazil), "ragpickers" (India), "gamines" (Bogota) or a variety of other names. In Naples, they are called "scugnizzo" (a spinning top always on the move); in Peru, the "pajaro frutero" (fruit bird looking out for the police in etn market place) and in Colombia, "gamin" (kid

having negative connotation). Official language tends to be softer and refers to street children as "children in an irregular situation" or "in difficult circumstances".

The UNICEF defines street children as follows :

"The term denotes a place of congregation, but also a certain set of working and living conditions. The vast majority are on the street to make a living for their families and/or themselves. Second, they spend large amounts of time in the street frequently because of the low returns on their labor. Third, most make their way in the informal sector as petty hawkers, shoe-shine boys, scavengers of raw material or even thieves and street prostitutes. Fourth, by the nature of their work and life, they are normally on their own, largely unprotected by adults. For these reasons, above all others, they are vulnerable to many dangers and abuses, and they tend to receive, few services essential to their protection and development". For these children the street, (in the widest sense of the word) more than their family, has become their real home, a situation where there is no protection, supervision, or direction from responsible adults.

As per the United Kingdom Committee for UNICEF, not all street children are alike. Hence, one way of defining them is on basis of their relationship with their families.

“ (i) About 75 percent of street children maintain contact with their families. They work on the street either under the supervision of employers inside or outside their family or are in business for themselves. They spend most nights with their family, contrary to popular belief. (ii) A growing percentage, currently some 20 percent spend all their days and some nights on the streets or in public places. Their families have not abandoned them, not they have abandoned their families, but poverty, violence, drink and sexual abuse have forced them out of their homes. Those children are increasingly vulnerable to the abuse and exploitation of street life and often develop a very negative view of themselves. (iii) Children who have no family at all make up 5 percent of all street children. They include orphans, runaways, refugees; these abandoned children suffer deep emotional disturbance”.

The National Workshop on Street Children, 1988, New Delhi defined street children as “All children who work in the street of urban areas without reference to the time they spend there or the reasons for being there”.

Among the vulnerable groups of children, India has the largest population of street children in the world. It is

estimated that New Delhi, Mumbai, Calcutta have around 1,00,000 street children each and Bangalore has 45,000. About 2000 fresh migrants enter Mumbai everyday of which a sizeable section is of minors. There are major problems in trying to estimate the magnitude of the problem as the population cannot be adequately covered by the national census, and they are not usually reflected in the educational or health statistics. The highly mobile character of the street child population places it outside official records or classifications. The realization about the problem of street children in India came quite late. As the identification of the street children phenomenon is recent, only a few studies have so far been conducted on the subject.

Exodus to cities like Mumbai has led to expansion of slums and pavement dwellings. Children of such migrant workers suffer from abuse, neglect, and exploitation. Children also become orphans and destitute due to natural calamities like floods, droughts, earthquakes, and environmental disasters. Children are also the most innocent victims of terrorisms, armed conflicts, and other political reasons. Girl children, especially in rural areas, remain deprived or adequate access to basic health care, nutrition, and education.

The study done in Mumbai found that street children live in constant dread of municipal authorities and policemen.

Under the Juvenile Justice Act, street children frequently find themselves in remand homes under trial as delinquents. If they are able to state where their parental home is, they may be sent back there. It is important to note that the majority of runaways tend to dodge the police, so the number of children coming to Mumbai annually would be much higher.

Delhi studies show that street children are mostly malnourished and are exposed to dirt, smoke and other environmental hazards. They suffer from chronic diseases like asthma, TB and other respiratory or gastro-intestinal diseases. They are neither covered under any health camp or programmes or schemes (like immunization), nor do they have easy access to government or municipal hospitals or health centres. Most of them have had no schooling or are dropouts.

A significant proportion of street children are working in the unorganized or informal service sector in every city, big or small, offering cheap labour, catering to various needs of city-dwellers. The majority of children live or work on the streets or urban India, labouring as porters at bus or railway terminals; as mechanics in auto-repair shops; or as vendors of food, tea and handmade articles. They work as street tailors or as rag-pickers, picking garbage and selling usable materials to local buyers. They are often seen polishing shoes in shopping and commercial centres,

working as domestic servants or as vegetable sellers, milk carriers and car cleaners. They carry heavy loads and work in cycle and automobile repair shops. They are also engaged in several hazardous industries and processes throughout the country. Many of them are also procured as sex workers. The parents / crime rings many a times use these children for begging around crossroads and places of worship.

Majority of the street children are boys. Their number is almost twice as that of girls on the streets. Girls are less visible on the street because they tend to work as domestic helps or enter business of prostitution or are required by the family to stay at home to look after younger siblings. Still many studies have shown a significant percent of working street girls, many of whom are employed as street hawkers. These children suffer from the worst kind of deprivation and denial of basic human rights like education, health, food, shelter, physical protection, security and recreation.

Street children are susceptible drug / alcoholic addiction and to inhalants, such as cobber's glue, correction fluid, gold / silver spray paint, nail polish, rubber cement, permanent / dry eraser makers and gasoline, which offer them an escape from reality and hunger. In exchange, they invite a host of physical and psychological problems, including hallucinations, pulmonary edema, kidney failure and irreversible brain damage. In order to secure a regular

dose of drugs / alcohol and inhalants, they resort to pick-pocketing, petty theft and even more serious crimes. Many of these children eventually turn into hardened criminals controlled by organized crime rings for drugs trafficking, prostitution and other unlawful activities, thus placing a heavy burden on the law and order machinery.

A study carried out at Shelter Don Bosco, Mumbai, in 2002 revealed that 60.3 % of 443 street children included in the study were substance users. Age group of substance users was 8 year to 18 year and half of them were between 14 year and 18 year. of age. Most of them earned Rs. 40 –100 per day and could purchase substances they were using. For children on the street, the question of survival is of paramount importance. Their days are spent in ensuring survival and the activities to this end range from begging, collection of edible from garbage, washing cars, pushing hand carts, singing in buses/trains, to cleaning gutters. Rag picking constitutes a major occupational category for street children. It is surely the most dehumanizing occupation where the nature of the work and the work environment are unhygienic, dangerous, demanding and destructive of self-worth. In this struggle for survival, the competition is ruthless and only the fittest survive. The street child, if fortunate enough to find a regular job is mostly under-paid and often has to work under ruthless employer who subjects

him to physical abuse, low wages. long working hours and demanding work. They are easy targets of assaults are frequently robbed or have to pay the dons for 'protection'. Many suffer personal violence.

These children are subjected to harassment by the police and city corporation officials. In 1979, the National Police Commission highlighted police violence against street children. However, many street children are detained, tortured and extorted money by the police without any fear of retribution. A Human Rights Watch report documents custodial death of 15 children from 1990 to 1994 and death of one child in remand home in 1996. The National Street Children Conference held in Mumbai, revealed that one of the most pressing problems of street children is the ill-treatment by city and railway police. The cops even instigate them to steal iron scrap from railway yards. The children have to constantly encounter police action. Often they are falsely accused and beaten upon severely. This is very damaging to their self-concept and self-esteem. They often become victims of physical assaults, homosexual attack and cruelty by anti social elements. Their psychosocial development is affected due to the deprivation and situation of risk they have to live with constantly. Deprived of the love, affection and sympathy of a family and subjected to exploitation, abuse and unhealthy work

conditions, these children develop a strong sense of inferiority and insecurity. This insecurity creates in them fear, anxiety and guilt which affects their mental health and well being. Because of their dirty and shabby appearance, they are not allowed to use recreational facilities like public parks. Due to the deprivation of healthy recreation, they find satisfaction in hedonistic pleasures and seek excitement and instant fun. Gradually they get separated from mainstream of society and get lured into antisocial activities which are easily found around the corner.

Most street children come on to streets when they should be in schools. Once they are on the streets they do not get themselves enrolled in the schools due to fear of identification. Therefore, we find a large number of these children illiterate keeping them away from any valuable information that is in print. It also makes them insecure about themselves as they find themselves singles out and lonely. They distrust the society and have no one of their own to rely upon. They thus take the support of substances and try and find a way to forget the agonies they are into. It offers users a mirage of escape from adversity and stress, but only makes their problems worse

Due to the very existence on the street these children lack protection from the elements of nature. They take shelter on bus stations railway stations, gardens and shady places. Since they are all alone they are scared and find the earliest chance to merge with already

existing groups of street children for security. Here they are subjected to peer pressures that make them yield to the vices that are dominant in the group so they are not a social outcast. They child feels secure there and in a short while feel secure and comfortable and safe and lands up with addictions for lifetime which still make him more marginalized in due course.

A very unique reason for street children getting hooked to addictions was found amongst the metal scrap pickers. They go to small metal scrap dealers to sell the collected metal scrap and being illiterate they have very little idea of the money transaction, they are cheated and some of these scrap dealers, to have constant source of scrap give part payment in form of cash and part payment in form of drugs, These children gets addicted and they become constant suppliers of scrap later on. The amount of drug needed by them goes on increasing making this child to work harder to get more metal and they also resort to stealing.

Interestingly the street children do not consider glue sniffing, charas, ganja and others as addictions needing help because they find a large number of their peers indulging in it . It is brown Sugar addiction they the street children consider as a major problem requiring help from outside.

Attitude of the law enforces towards street children is generalized because many of the delinquent street children resort to stealing and nuisance in the society so they perceive all the street

children and are a nuisance factor and treat them in an unfriendly behaviour . This keeps the street child away who may have just left home or his new comer to the street culture, from the protections they can receive from the police. This child is indirectly forced to seek protection from the street groups that are already existing on the streets and making them yield to peer pressures of substance addictions

They do not seek help that may be necessary at times. In fact children hide and run away from the police fearing that they will round them up and put them behind the bars for the crime they have not committed.

Vulnerable children and youth frequently abuse inhalants. Unlike other drugs of abuse, inhalants are defined by their route of administration and are mostly legal substances (such as art and office supplies, industrial chemicals, or aerosol propellants) which are easily available, inexpensive, and used primarily by disadvantaged group.

Inhalants produce an initial euphoria followed by prolonged depression, dizziness, nausea, impaired judgment, changes in perception, and speech problems. Hallucinations and sudden death have been reported with high doses. Users report experiencing a high and say they use inhalants to prevent

sadness or boredom or to avoid a problem. Chronic use results in memory loss, paranoia, depression, headaches, sleep disruption, and neurological damage. A very dangerous situation arises due to altered judgment making them more vulnerable to accidents

Fights amongst the street groups are also to a large extent due to addictions as they want to show loyalty to the group they belong to. They also have group fights due to money transactions needed for drugs. A street child thus, moves from one place to another and makes himself more insecure and vulnerable to other addict.

Most street children develop distrust and hatred towards all forms of authority and therefore it is difficult to reach this specific group of children. They do not have sufficient access to even basic services required for their healthy growth and development.

It is therefore, essential for child health-care providers to understand the needs of this special group. It is also, necessary to recognize early signals of emotional disturbances in children living in families to prevent them from becoming 'street children'.

The effects of child rearing practices during the crucial periods of growth and development are powerfully depicted in the following poem.

**If A Child Lives With. . .**

by Dorothy Law Nolte

- If a child lives with criticism ..... he learns to condemn.
  - If a child lives with hostility ..... he learns to fight.
  - If a child lives with fear ..... he learns to be apprehensive.
  - If a child lives with jealousy ..... he learns to feel guilt.
  - If a child lives with tolerance ..... he learns to be patient.
  - If a child lives with encouragement ..... he learns to be confident.
  - If a child lives with praise ..... he learns to be appreciative.
  - If a child lives with acceptance ..... he learns to love.
  - If a child lives with approval ..... he learns to like himself.
  - If a child lives with recognition ..... he learns that it is good to have a goal.
  - If a child lives with honesty ..... he learns what truth is.
  - If a child lives with fairness ..... he learns justice.
  - If a child lives with security ..... he learns to trust in himself and others .
  - If a child lives with friendliness ..... he learns the world is a nice place in  
which to live.
-

## Fetal Growth – Role of Maternal Nutrition

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### Introduction

Growth and development begins at the moment of conception and is a continuous process, until the epiphyses fuse and growth in height ceases<sup>1</sup>. The rate of growth varies in different phases of life and intrauterine period of life is a very important phase of growth. Future health status gets programmed during this phase of life. Intrauterine Growth is dependent on different factors and all organs are not equally affected in the growth retarded newborn.

Brain growth is very rapid during 20-36 weeks of gestational life attaining around 67% of the adult size at birth<sup>1</sup>. This indicates that inadequate growth during fetal life interrupts brain growth massively which decreases the cognitive development of future citizens.

### Magnitude of the Problem

In developing countries incidence of low birth weight (LBW) babies is very high (10%-40% -in different countries). In India it is 30% ,currently (UNICEF). LBW affects further growth and outcome also. Mortality and morbidity rate, both are increased in growth retarded babies during first five years of life, mainly. Though the millennium developmental goal (MDG) was to reduce infant mortality rate and under 5 mortality rate

by 2/3 between 1990-2015, India is far behind this goal<sup>2</sup>. Thus to achieve this, measures to be taken to increase the birth weight.

### Determinants for Fetal Growth

There are several factors which determine the growth of fetus, some are modifiable and some predetermined. Some factors are related to maternal conditions, some related to fetal conditions, and some to placental function<sup>3</sup>.

Among maternal factors, socioeconomic status, race, ethnicity are non modifiable factors. Low socio-economic status precipitates the birth of LBW baby but this is not an independent factor because lower family income results decreased availability of nutritious foods, illiteracy which are precipitating causes of LBW babies.

There is enough evidence to suggest that there is also genetic and constitutional predisposition for giving birth to growth retarded babies.

Previous obstetric history also determines fetal growth. If a mother has previous history of giving birth to LBW baby, chance of having another IUGR baby is greatly increased.

Maternal nutrition, antenatal care, these

are modifiable maternal determinants.

Antenatal care is an important factor. If the mother continues to remain engaged in heavy physical work during last trimester also, the fetus gets compromised.

Maternal nutrition is a very important factor for fetal growth specially in developing countries. If a woman takes during last few weeks of pregnancy, extra 200 calorie and 20 g protein more than her normal pre pregnancy intake, her fetus gain additional 110 g weight.

Micronutrients also plays very important role for fetal growth. 100 mg iron and 500 mcg folic acid per day for at least 100 days during pregnancy increases 300g fetal weight.

Folic acid is very important during first 12 weeks of pregnancy; Iodine is invaluable during first 20 weeks of pregnancy. Zinc, copper, manganese, vitamin B complex these are also should be provided for fetal growth. WHO also recommends to provide at least these micronutrients.

Maternal weight and height also determines fetal growth. Malnourished, stunted mothers give birth to IUGR babies.

Viewing weight gain during pregnancy birth weight can be predicted. If the weight gain is less than 7 kg, there is 40% chance of giving birth to LBW babies.

Placental dysfunction and disorder compromises fetal growth. Regular antenatal check up can diagnose these problems at the earliest.

Chronic systemic disease like diabetes mellitus, hypertension, tuberculosis, anemia compromises fetal growth. So earliest diagnosis and proper prophylactic measure is should be a routine. In developing countries like India chronic malaria also puts heavy toll on fetal weight gain. Proper prophylaxis of malaria can increase the birth weight as much as 170 g.

Mothers should be discouraged for any addiction specifically during pregnancy. Because if she smokes 400 m tobacco /day her fetus gain 542 g less weight than its capacity and 2 alcoholic drink/day decreases 155 g weight.

Environmental pollution, Fetal sex (female fetus gain slightly less weight than male), chromosomal and genetic disorder, intrauterine infection like TORCH also affects birth weight.

#### **Consequences of Low Birth Weight**

IUGR carries both short- and long-term disadvantages for the infant. The disadvantages show continuous trends into the normal range of birth weight, suggesting that the division of newborns into two groups, small or appropriate based on a fixed cutoff point, may underestimate the occurrence of fetal growth retardation<sup>4</sup>.

Short-term consequences of IUGR include an increased risk of fetal, neonatal and infant death and impaired postnatal growth, immune function and intellectual development<sup>5</sup>. The exponential rise in relative risk for neonatal mortality at birth weights below 2.5–3.0 kg is similar in all populations

although absolute death rates are considerably higher in developing countries<sup>6</sup>.

Long-term consequences include an increased risk of adult chronic disease (cardiovascular disease and type 2 diabetes)<sup>7,8</sup>. This increased risk has been attributed to permanent changes in structure and metabolism resulting from under nutrition during critical periods of early development (the fetal origins of adult disease hypothesis)<sup>7</sup>. An inadequate supply of nutrients, forces the fetus to adapt, down-regulate growth and prioritize the development of essential tissues. Adaptations include preferential blood flow to the brain and reduced flow to the abdominal viscera, altered body composition (reduced muscle mass) and reduced secretion of and sensitivity to the fetal growth hormones (insulin-like growth hormone and insulin). These adaptations enhance immediate survival but may carry a long-term price. An association between low birth weight and later insulin resistance supports this findings. LBW is a strong risk factor for both cardiovascular disease and type 2 diabetes and this is a consistent finding in a number of populations<sup>9</sup>. In a study on south India, the same association has been shown in both adults and children<sup>10,11</sup> and there are similar findings from China<sup>12</sup> and Jamaica<sup>13</sup>. Low birth weight has also been linked to higher blood pressure in children<sup>11,14</sup> and coronary heart disease in adults<sup>15</sup> in developing countries. The

combination of low birth weight followed by obesity in later life appears to carry the greatest risk of insulin resistance. The persisting high incidence of IUGR, along with a worldwide increase in obesity, may therefore contribute to the epidemic rise of cardiovascular disease and type 2 diabetes in developing countries<sup>16,17</sup>.

IUGR also has adverse consequences for future generations. It forms part of an intergenerational vicious cycle of deprivation<sup>17</sup>. For example the poor postnatal growth of low-birth-weight girls increases their own risk of producing low-birth-weight infants.

#### **What Is Known rom Different Studies**

Recently different studies are conducted in different parts of the world to determine the factors that affect fetal growth. It is found that in both developed and developing countries macro-nutrients have important effect on fetal growth and development. Some micronutrients like iron , folic acid also have such universal effects . But though other micronutrients improve fetal growth in developing countries where mothers are predominantly malnourished, it has hardly any effect in developed countries. As India is a developing country and here 80% mothers are malnourished and anemic, nutritional supplementation can have an important role<sup>4</sup>.

In Pune, a food based study was carried out during 1994-1997. One

interpretation of the Pune Maternal Nutrition Study findings is that, in this population low intakes of the micronutrients supplied by GLVs( green leafy vegetables), fruit and milk limit fetal growth, especially in energy-deficient mothers<sup>17</sup>.

Another study in Australia, also showed small size at birth has been associated with an increased risk of central obesity and reduced lean body mass in adult life. This study investigated the time of onset of prenatally induced obesity, which occurs after maternal feed restriction, in the guinea pig, a species that, like the human. They develop substantial adipose tissue stores before birth<sup>18</sup>.

WHO technical committee also showed that maternal undernutrition exerts its influence through the stunting of growth during the mother's childhood ,which leads to short stature and a low pre pregnancy weight, especially when combined with frequent diarrheal episodes because of poor sanitation and a lack of safe water. In addition to under nutrition during childhood, maternal birth weight also has a bearing on fetal growth, if a mother was herself a small baby, she is more likely to produce small baby. Although as yet its effects on embryonic and fetal growth are poorly understood, the quality of the peri conceptional diet is considered to be another important determinant of fetal growth. They (WHO) also tried to formulate an ideal diet during

pregnancy<sup>19</sup>.

Studies also showed the strong relationship between infection and nutrition. Epidemiological studies have emphasized the impact of malaria, diarrhea and AIDS on maternal nutrition. Pelvic inflammatory disease, severe reproductive tract infections and urinary infections may also be important. Clinical studies have emphasized that there are characteristic mechanisms which explain the reason why mothers become malnourished during infection. Firstly, dietary intake may be reduced. Secondly, nutrient absorption may be decreased. Thirdly, the metabolic stress of infection may increase the requirements for nutrients by the mother herself. In addition to the impact of infection on the nutritional status of the mother herself, there may be a striking change in blood flow to the placenta during febrile conditions, with a negative impact on nutrient flow from mother to fetus<sup>20</sup>.

Another study in UK also showed that suboptimal first-trimester growth may be associated with low birth weight, low birth-weight percentile, and premature delivery<sup>21</sup>.

Chinese Centre for Disease Control and Prevention has showed that supplementation with multimicro-nutrients can improve maternal health and fetal growth.

One trial of a multivitamin supplementation on HIV-positive pregnant women in

Tanzania showed increased birth weight and fewer fetal deaths<sup>22</sup>.

**How Can We Improve Fetal Growth**

Only the modifiable factors can be improved to increase fetal weight, their growth and development. Some of the factors which can be easily modified are the following:

**Nutrition :**

Improving maternal nutrition should be the first and foremost step to improve fetal growth and development specially in developing countries like India. Various Indian studies also supported that.

Ideally a pregnant woman should increase her daily food intake in the following way :

- (i) 6 to 11 servings of cereals
- (ii) 3 to 5 servings of vegetables
- (iii) 2 to 4 servings of fruits

(iv) 4 to 6 servings of milk and milk products

(v) 3 to 4 servings of protein foods

(vi) 6 to 8 glasses of water

But in developing countries, it is quite impossible for common mass. So for them , it should be at least 400 kal (total extra energy) and 15 g extra protein perday throughout pregnancy. Along with proteins, carbohydrate, vitamins and minerals intake also should be increased. 60% of total calories must come from carbohydrate, 18% from protein and 22% from fat. Importance of fresh fruits and vegetables also cannot be undermined.

Some of the most common nutrients a pregnant woman need and, the foods that contain them are mentioned in the Table 1.

*Table 1. Nutrients and Their Best Sources*

<b>Nutrient</b>	<b>Best sources</b>
Protein	Pulses, beans, lean meat, fish, egg whites .
Carbohydrates	Breads, cereals, rice, potatoes, fruits, vegetables
Calcium	Milk, curds, cheese, fish with bones, spinach
Iron	Lean red meat, spinach, iron-fortified whole-grain breads and cereals
Vitamin A	Carrots, dark leafy greens, yellow colored fruits.
Vitamin C	Citrous fruits and fruit juice, fresh vegetables, tomatoes,
Vitamin B6	Meat, whole-grain cereals, bananas
Vitamin B12	Meat, fish, poultry, milk (Vegetarians who don't eat dairy products need supplemental B12)
Vitamin D	Fortified milk, dairy products, cereals
Folic acid	Green leafy vegetables, dark yellow fruits and vegetables, beans, peas, nuts
Fat	Meat, whole-milk dairy products, nuts, vegetable oils (limitation of fat intake is 30% or less of total daily calorie intake)

Ideally a pregnant woman should gain 12-14 Kg during pregnancy , which is used for fetal and maternal growth in this way:

- (i) 3.0 kg: Average baby's weight
- (ii) 2.5 kg: Extra stored protein, fat, and other nutrients
- (iii) 1.5 kg: Extra blood
- (iv) 1.5 kg: Other extra body fluids
- (v) 0.75 kg: Breast enlargement
- (vi) 0.75 kg: Enlargement of your uterus
- (vii) 0.75 kg: Amniotic fluid surrounding your baby
- (viii) 0.5 kg: The placenta

But for mothers of developing countries, there should be at least 1 kg weight gain during first trimester and for next two trimesters, at least 4.5 kg/trimester.

Besides these, recently researchers from the Netherlands and Scotland have found that eating apples throughout pregnancy may protect against wheezing and asthma in 5-year-old children, while fish consumption may lower the risk of eczema, an allergic skin condition. The study found that children of women who ate more apples and fish during their pregnancy were less likely to develop asthma or allergic disease. Specifically, children of women who ate fish once or more a week were 43 per cent less likely to have had eczema at age 5 than children of mothers who never ate fish. Those whose mothers ate more than four apples a week during

pregnancy were 37 percent less likely to have ever wheezed, 46 percent less likely to have had asthma symptoms, and 53 percent less likely to have had doctor-confirmed asthma compared to children of mothers who ate one or no apples a week<sup>24</sup>.

#### **Rest :**

Proper rest during pregnancy , specially during third trimester is also very important , it prevents prematurity also.

#### **Others :**

O<sub>2</sub> therapy and Intermittent abdominal Decompression was also tried without any positive result.

#### **Conclusion**

Finally it can be concluded that , there are lots of modifiable factors which can be taken care of , to improve fetal growth and development in India and also other developing countries. One of the main factor is maternal nutrition .To improve this , the socio-economic condition of the country also should be improved. Mothers should be educated and should understand their importance and rights in society.

Before implementing an ideal pregnancy diet, well-conducted randomized controlled trials of adequate sample size and including measures of effectiveness are needed in populations at high risk of micronutrient deficiency and IUGR. This include both food-based and medicine supplemented (multivitamins and multi-minerals), interventions and better

measurements of fetal growth, maternal metabolism, and long-term outcomes in the offspring.

All these can improve the average birth weight and neonatal health, in the long run can help India to achieve Millenium Developmental Goal.

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## **Counseling and Management in Behavioral Problems of Children and Adolescents**

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Children can have mental, emotional, and behavior problems that are real and painful. These problems, often called “disorders,” are sources of stress for the child as well as the family, school, community, and larger society.

The number of families who are affected by mental, emotional, and behavior disorders in children is staggering. It is estimated that as many as 1 in 5 children or adolescents may have a mental health problem that can be identified and treated. The term serious emotional disturbances refers to a mental health problem that severely disrupts a person’s ability to function socially, academically, and emotionally.

Mental health disorders in children and adolescents are caused by biological factors, environment, or a mix of both. Examples of biological factors are genetics, chemical imbalances in the body, and damage to the central nervous system, such as a head injury. Many factors in the environment can affect the mental health, such as exposure to violence, extreme stress, and loss of a person close to the child.

Many of the symptoms and much of the distress associated with childhood and adolescent mental, emotional, and behavior problems may be alleviated

with timely and appropriate treatment and support services.

A child or adolescent in need of treatment or services and his or her family may need a plan of care based on the severity and duration of symptoms. Optimally, this plan is developed with the family, service providers, and a service coordinator, who is referred to as a case manager. Whenever possible, the child or adolescent is involved in decisions.

Parents are often particularly concerned about breath holding spells. Although some children hold their breath until they lose consciousness, sometimes leading to a seizure, there is no increased risk of seizure disorders in children who have had a seizure during a breath holding spell. As with other types of tantrums, parents are best advised to ignore breath holding once it has started. Without sufficient reinforcement, breath holding most often disappears. In most toddlers, this is not a voluntary act of “defiance.”

*Negativism, temper tantrums and breath holding spells* – The first key to the office management of negativism (“terrible 2s”), temper tantrums, and breath holding spells is to help parents to intercede before the child is highly

distressed. The pediatrician should advise parents to look for early signs of oppositional behavior and then to calmly place the child in time-out for 2–3 minutes. When breath holding does not respond to parent coaching or is accompanied by head banging or high levels of aggression, referral for developmental evaluation or family counseling is indicated.

*Anger* – If behavioral measures such as time-out fail, physicians must assess how the parents handle anger before making further recommendations about how to approach the child's problems. Children are often frightened by the strength and intensity of their own angry feelings and by the intensity of the angry feelings they arouse in their parents. It is therefore of prime importance that parents model the anger control that they wish their children to exhibit. Some parents are unable to see that they sometimes lose control themselves; this denial does not help their children to internalize controls. Advising parents to calmly provide simple choices will help the child to feel more in control and to develop a sense of autonomy. Providing the child with options also typically helps reduce the child's feelings of anger and shame. Such negative, internalized feelings may later have adverse effects on interpersonal relationships, intimacy, and personality development.

*Lying* – In school-aged children, lying most often is an effort to cover up something that the child does not want

to accept in his or her own behavior. The lie is invented to achieve a temporary good feeling and to protect the child against a loss of self-esteem. Although lying is common in childhood, children with low self-esteem are more prone to lie habitually. In many cases, habitual lying is also promoted by poor adult modeling. When mothers and fathers accuse each other frequently of lying, the child, drawn into a loyalty conflict, is likely to become distressed and increase defensive lying. Many adolescents lie to avoid parental disapproval. As with other antisocial behaviors, lying may be used as a method of rebellion.

Regardless of age or developmental level, when lying becomes a frequent way of managing conflict and anxiety, intervention is warranted. Initially, the parents should confront the child to give a clear message of what is acceptable. At the same time, sensitivity and support are necessary for a successful intervention, because children and adolescents may react to their shame and embarrassment with angry denial and acting out. If the situation cannot be resolved through parental understanding of the situation and the child's understanding that lying is not a reasonable alternative, professional intervention is indicated. In some cases, chronic lying occurs in combination with several other antisocial behaviors and is a sign of an underlying psychopathology or family dysfunction.

*Stealing* – Almost all children steal something at some point in their lives. When preschoolers and school-aged children steal more than once or twice, the behavior may be a response to a sense of internal loss. These children frequently feel neglected and are, in fact, emotionally deprived. Their stealing is impulsive, but the gratification derived does not satisfy the underlying need. In children and adolescents, stealing can sometimes be an expression of anger or revenge for real or imagined frustrations by the parents. In many instances, stealing becomes one way in which the child or adolescent can manipulate and attempt to control interactions with parents. Like lying, stealing can be learned from adults. Parents who boast about outwitting tax laws or exceeding speed limits are implicitly condoning rule breaking as an acceptable behavior.

It is important for parents to help the child undo the theft by returning the stolen articles or by rendering their equivalent either in money that the child can earn or in services. When stealing is part of a pattern of conduct problems, referral to a child psychiatrist is warranted. Both problematic peer influence and lack of parental supervision may exacerbate stealing and other conduct problems. Interventions as simple as getting a child a Big Brother or Big Sister have been shown to improve school function and diminish conduct problems. In some

cases, more intensive intervention may be necessary.

*Truancy and run away behavior* – Truancy and run-away behavior are never developmentally appropriate. Approximately half of school refusal incidents result from child and adolescent behavioral problems; the other half of incidents are related to mood and anxiety symptoms. Often, truancy represents disorganization within the home, developing personality problems, or both. Whereas younger children often threaten to run away out of frustration or a desire to get back at parents, children who run away with nowhere to go are almost always expressing a serious underlying problem. During middle childhood, most runaways are escaping abuse and neglect within the home. In adolescence, disagreements with the parents, developing personality problems, and abuse and neglect all must be considered as possible precipitants. Adolescent runaways are at extremely high risk for substance abuse, intimate partner violence, and other risk-taking behaviors.

*Fire setting* – Although interest in fire is ubiquitous in early childhood, unsupervised fire setting is always inappropriate. Early school-aged children tend to set fires because of both curiosity and latent hostility secondary to deprivation within a disorganized and neglectful family. These young children set fires by themselves within their homes. In adolescence, fire setting is a

sign of delinquency; again, traumatic experiences, often associated with family conflict, are common. Teenagers often set fires in small groups, seeking revenge on school and community authorities.

Fire setting always requires intervention by the parents and generally also by mental health professionals. A combination of family therapy, alliance-building individual therapy, parent management training, and community involvement is often necessary to effect a reasonable change. The recidivistic young fire setter is very difficult to manage. Many adult arsonists were childhood fire setters.

*Antisocial behavior* – Although there is no totally satisfactory theory about the nature and cause of antisocial behavior, risk factors within the individual and the family have been identified. Adoption and twin studies strongly suggest that both genetic factors and child-rearing practices contribute to the development of aggressive behaviors. Adopted children with antisocial biological fathers presented later in life with more antisocial behaviors than did those with antisocial adoptive fathers. Children with both antisocial biological fathers and antisocial adoptive fathers were the most antisocial in later life. Socio-cultural factors, temperament, some psychiatric conditions, and cognitive limitations can also predispose individuals to antisocial acting out.

*Aggression* – Aggression is a serious

symptom and is associated with significant morbidity and mortality in childhood. Data suggest that aggression is often stable over time. Children may not “grow out” of this behavior; early intervention is indicated for persistent aggressive behavior. Aggressive tendencies are heritable, although environmental factors may promote aggression in susceptible children. Both enduring and temporary risk conditions affecting a family may increase aggressive behavior in children. Aggression in childhood is correlated with family unemployment, discord, criminality, and psychiatric disorders as well as births to teenage or unmarried mothers. Boys are almost universally reported to be more aggressive than girls. A difficult temperament and later aggressiveness have been shown to be related, although there is evidence that these children may elicit punitive caregiving within the family environment, setting up a cycle of increasing aggression. Aggressive children often misperceive social cues and react with inappropriate hostility toward both peers and parents. Nonetheless, marital discord and aggression within the home certainly contribute to aggression by children.

Clinically, it is important to differentiate the causes and motives for childhood aggression. Intentional aggression may be primarily instrumental, to achieve an end, or primarily hostile, to inflict physical or psychological pain. Children

who are callous and not empathetic and who are frequently aggressive require mental health intervention. These children are at high risk for suspension from school and eventual school failure. Learning disorders are common, and aggressive children should be screened. Other forms of psychopathology are not uncommon; in particular, aggressive children with attention-deficit/hyperactivity disorder may have oppositional-defiant disorder and/or conduct disorder. Some aggressive, impulsive children may instead have bipolar disorder; a family history of mood disorders, grandiosity, and cyclic mood disturbance may be evident in the history of these children.

Aggressive behavior in boys is relatively consistent from the preschool period through adolescence; a boy with a high level of aggressive behavior at 3-6 year of age has a high probability of carrying this behavior into adolescence, especially without effective family-focused intervention. The developmental progression of aggression among girls is less well studied. There are clearly fewer girls with physically aggressive behavior in early childhood; interpersonal coercive behavior, especially in peer relationships, is not uncommon among girls and appears to be related to the development of more physical aggression in adolescence (fighting, stealing).

Children exposed to aggressive models on television or in play show more

aggressive behavior compared with children not exposed to these models. Children may imitate parental anger and aggressive when they are physically or psychologically hurt. Parental abuse may be transmitted to the next generation by several modes: children imitate aggression that they have witnessed, abuse can cause brain injury (which itself predisposes the child to violence), and internalized rage often results from abuse.

*Conduct disorder and oppositional defiant behavior* – Conduct disorder is a distinct clinical entity manifested by several different antisocial behaviors: stealing, lying, fire setting, truancy, property destruction (vandalism), cruelty to animals, rape, use of a weapon while fighting, armed robbery, physical cruelty to others, and repeated attempts to run away from home. A pattern of such behaviors that has existed for at least 6 months warrants the diagnosis of conduct disorder. Between 75% and 85% of patients treated at adolescent psychiatric clinics present with symptoms of conduct disorder. Oppositional defiant disorder is defined by less severe behavior than conduct disorder: loss of temper, continuous arguing with authority figures, defiance of rules, continual blaming of others, angry and resentful affect, spiteful and vindictive behavior, and frequent use of obscene language. Some children may present with symptoms of all 3 disruptive behavior disorders (ADHD, oppositional-

defiant disorder, and conduct disorder). Children with ADHD are significantly more likely to meet the criteria for oppositional-defiant disorder than those with other presenting problems. Still, the majority of children diagnosed with a disruptive behavior disorder meet the criteria only for that disorder. The risk factors (from the child, parent, or environment) associated with the development of conduct disorder are very similar to those mentioned in association with the development of specific antisocial and aggressive behaviors. Aggressive behavior is stable across generations within families. Inconsistent parenting practices and overly punitive disciplinary measures have been associated with conduct disorder in children. Parents of children with conduct disorder are less accepting of their children and show them less warmth and support compared with parents of unaffected children. Adult criminality is predicted by an early age of onset of conduct disorder symptoms, numerous episodes and varieties of antisocial behaviors, parental criminality, and marital discord.

In many children, oppositional behavior may appear in the form of passive-aggressive behaviors. Prevalence rates of 16–22% have been noted. Children with passive-aggressive behavior express hostility indirectly as procrastination, stubbornness, or resistance. Parents often complain that such children do not hear them and do not

respond to repeated requests. Academic underachievement is common. Children may unconsciously adopt passive-aggressive strategies for a variety of motives: to gain independence while maintaining dependence, to counter underlying low self-esteem, to maintain control and autonomy when threatened by anxiety, and to get revenge. These children are fearful of direct expression of assertiveness, aggression, and hostility. The child-rearing styles of their parents are often intimidating, critical, and inconsistent, or on the other hand, indulgent and permissive.

### **Management of Behavioral Problems in Children and Adolescents**

Counseling children and their families is the mainstay of management of children having behavioral problems. Many different approaches have been used in the treatment of children and adolescents with aggressive behavior, conduct disorder, and oppositional-defiant disorder. Individual treatment focusing on alliance building and conflict resolution is sometimes useful in establishing the basic trust necessary for a positive therapeutic outcome. Individual therapy is not always effective in ameliorating behavioral problems. Group therapy has shown some promise in treating adolescents with behavioral difficulties; anger management therapy has demonstrated some positive results with younger children. Training in problem-solving skills involves modeling, role-playing, and practicing to help children

deal more successfully with interpersonal relationships; it is somewhat effective in modifying maladaptive styles of relating and behaving. Effective results have been obtained with parent management training, in which parents are trained directly to promote prosocial behaviors within the home and to place reasonable limits on unwanted, destructive behaviors. In the case of passive-aggressive behavior, for instance, parents would be encouraged to set firm limits and expectations for the child and to reach agreement with the child on his or her important tasks and responsibilities. Compliance and age-appropriate assertiveness and independence are then promoted and rewarded. Multisystemic therapy, an in-home treatment involving the identified patient, parents, siblings, and peers as well as school, neighborhood, and other environmental forces, has been shown to be effective with aggressive children and adolescents who have conduct disorder. This multilevel approach is informed by data on the varying ecologic risks related to conduct disorder.

Generally one session of counseling is not adequate for most parents and children; a series of sessions are required to be held by a professional counselor. The initial phase of counseling consists of collection of information. Parents usually confess that they do not understand what's wrong with their child and feel concerned about child's behavior. A separate interview with the child is important part of counseling therapy as it may reveal many surprises and help the counselor to get an idea about the child's emotionality. The next phase consists of in-depth exploration of the issue. Again this may require several sessions separately with parents and the child. During these sessions most information is collected for detailed analysis of the situation. Home-visits, school-visits and interviewing peers may be necessary. Acceptance, adjustments and appreciation are key words during the counseling sessions for behavioral therapy.

It is important for pediatricians to learn about this form of management to help the child and parents with appropriate referral services.

## **An Introduction to the PEDS**

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### **What is the Parents' Evaluation of Developmental Status (PEDS)?**

The PEDS is a methodology for detecting developmental and behavioural problems in children from birth to eight years of age. This methodology involves asking parents to complete a ten-item questionnaire, which takes only a few minutes.

There is method for detecting and addressing developmental and behavioral problems in children

Fewer than 70% of children with developmental and behavioral problems are identified before school entrance. Although most of these children receive routine pediatric care or attend preschool programs, their problems do not come to the attention of health professionals and teachers. Under-detection is due to the subtle and emerging nature of children's difficulties. For example, most children with disabilities walk, talk, and eventually read, but not as well as is necessary for school success.

### **What Happens When Childhood Problems Are Not Identified?**

Failure to detect difficulties means that many children do not receive the benefits of early intervention. Early intervention

greatly increases the likelihood of graduating from high school, of living independently, avoiding teen pregnancy, holding a job, etc. The absence of early intervention contributes to the fact that 1 in 3 children have either disabilities or substantial school difficulties; 18% drop out of high school.

### **How Was the PEDS Developed?**

The PEDS was developed in the USA by Frances Page Glascoe PhD, a respected researcher who has published widely in the area of developmental screening and the early detection of developmental and behavioural problems. The ten-items on the questionnaire were chosen on the basis of research data, and the language used in the questions was selected carefully.

The Centre for Community Child Health, Royal Children's Hospital, Melbourne, has used the PEDS with hundreds of children and families across a variety of community-based settings. The language of the PEDS was changed to conform to Australian language usage. Parents and professionals found it useful and had no difficulty with the process.

### **How to use PEDS ?**

The PEDS can be used in two ways.

### **1. As a Developmental Screening Test:**

When the parental responses to the ten-item questionnaire are transferred to the score sheet, interpreted according to the guidelines provided. In this way professionals will use the PEDS as a way of eliciting parental concern; they will score and interpret the form and then act according to their clinical experience.

### **2. As An Informal Means to Elicit and Respond to Parental Concerns**

The ten-item questionnaire is a structured way of beginning a dialogue with parents about any concerns they may have about their child's development or behaviour, promoting a family-centred approach to practice.

Where the PEDS is used as a formal screening test, we would urge the usual cautions. A screening test is not diagnostic, and clinical diagnoses should not be made on the basis of responses on the PEDS. If the use of the PEDS raises major concerns about the child, then a proper assessment needs to take place before any firm clinical conclusions can be made.

### **How Can Problems Be Detected Early?**

One of the most brief and accurate methods for early detection is Parents' Evaluations of Developmental Status or PEDS. PEDS is both an evidence-based surveillance tool and a screening test, it is also a tool for managing a wide range of developmental, behavioral and family issues. With ten short questions to

parents, PEDS helps professionals identify children at risk for school problems and those with undetected developmental and behavioral disabilities. PEDS helps one decide:

- (i) Whether a child needs a developmental evaluation or mental health assessment?
- (ii) If so, what kinds of testing are needed?
- (iii) Should a developmental screening test be administered?
- (iv) Do parents simply need advice, and if so, on what topics?
- (v) Should a child be watched carefully over time to ensure prompt attention for any emerging problems?
- (vi) Are reassurance and monitoring all that is required?

### **What Are the Components of the PEDS and How is it Administered?**

There are three components of the PEDS, these being:

1. *PEDS Response Form* – This is a one page questionnaire that includes ten items, and is to be completed by the parents. This form is available in English, Somali, Chinese and Spanish.
2. *PEDS Score Form* – The parent's responses to the ten item questionnaire (*PEDS Response Form*) are transferred onto the *PEDS Score Form*.
3. *PEDS Interpretation Form* – The

information from the PEDS Score Form is interpreted using this form and determines the appropriate path to follow.

*PEDS Brief Administration and Scoring Guide* – This provides the outline on how to use the three forms that make up the PEDS.

### **Why is a Parent Questionnaire Administered Rather than the Usual Sorts of Developmental Screening Tests?**

Research suggests that if parents are asked the right questions in the right way, they are very accurate observers of their child's strengths and weaknesses. One of the criticisms of developmental screening tests is that they tend to be performed in isolation without taking into account the socio-cultural context in which a child grows up, and without having systematic input from parents, who know the child best. Apart from the time, costs and special training needed to administer developmental screening tests, there have been concerns that not involving parents actively in the process diminishes their accuracy and makes it less likely that recommendations will be followed.

### **Who Can Use the PEDS?**

The PEDS can be used in virtually any setting – its use is not confined to health professionals such as doctors and nurses. In Australia the PEDS has been used in:

- (i) Childcare centres,

- (ii) Preschools and kindergartens,
- (iii) Maternal and child health centres,
- (iv) General practices,
- (v) Pediatricians' offices

### **Basic PEDS Training (2-3 Hours)**

This brief session has been designed for those providers who wish to mainly utilise the PEDS as a structured discussion tool within the context of their practice and are interested in limited training. Childcare workers, preschool teachers and primary teachers may find this type of training session very useful.

The main components include:

- (i) Importance of early childhood and child development.
- (ii) Importance of parental concern.
- (iii) PEDS as a communication and referral tool.
- (iv) The role of the professional.

### **When Can One Use the PEDS?**

The PEDS can be used in a number of different ways. Some professionals may use the PEDS on a regular basis, eg. each year on the child's birthday or at the scheduled visit with the community nurse. Others may administer the PEDS when the child is first enrolled in a particular community setting, eg. preschool, school or at regular parental interview times. Some professionals may use it as a formal developmental screening test, while others may use it informally to elicit and respond to parent concerns. The flexibility of the PEDS

means that it can be used in a variety of different ways, and developmental concerns and progress can be monitored over time.

### **What Is a Secondary Screen and When It Is Needed?**

When the PEDS is used as a developmental screen it also requires the use of a secondary developmental screen, particularly to decrease the chance of referring children unnecessarily (improving the specificity). There are a number of secondary screens available. Secondary screens may be a more extensive parent report questionnaire such as the Age and Stages Questionnaire or through more “hands on” developmental screening such as the Brigance screens.

### **Here’s What to Expect**

Extensive research on the relationship between parents’ concerns and children’s behavior and development reveals the following about children:

- (i) Eleven per cent have a high risk of disabilities and need referrals for further evaluations.
- (ii) Twentysix per cent have a moderate risk of disabilities and need additional developmental screening and/or scrutiny of health, vision, and

hearing as well as parent education, watchful waiting, or referrals to enrichment programs like Head Start or quality preschool.

- (iii) Twenty per cent have a low risk of disabilities and need mostly behavioral guidance.
- (iv) Forty three per cent have a low risk of disabilities and need only routine monitoring.

### **How Reliable and Valid Is the PEDS?**

The use of the PEDS as a screening test has been validated against standard psychometric tests in a series of studies in the USA. As a screening test, the PEDS has similar sensitivity and specificity to other commonly used developmental screening tests, but is much shorter and simpler. It also has the advantage of involving parents in the process.

The PEDS has been validated on close to a thousand children and families in North America, and has psychometric properties in keeping with standards for other developmental screening tests (sensitivity and specificity between 70-80 per cent). However, it has the advantage of being brief, simple to use, and actively involves parents.

## PEDS Response Form

Child's Name ----- Parent's Name -----

Child's Birthday----- child's age ----- Date -----

Please enlist any concerns about your child's learning, development, and behavior

Do you have any concerns about how your child talks and makes speech sounds?

Circle one    No        Yes        A little        Comments

Do you have any concerns about how your child understands what you say ?

Circle one    No        Yes        A little        Comments

Do you have any concerns about how your child uses his / her hands and fingers to do things ?

No        Yes        A little        Comments

Do you have any concerns about how your child uses his / her arms and legs ?

Circle one    No        Yes        A little        Comments

Do you have any concerns about how your child behaves ?

Circle one    No        Yes        A little        Comments

Do you have any concerns about how your child gets along with others ?

Circle one    No        Yes        A little        Comments

Do you have any concerns about how your child is learning to do things for him/ herself ?

Circle one    No        Yes        A little        Comments

Do you have any concerns about how your child is learning preschool or school skills ?

Please listy any other concerns.

## Nutrition is the Key To Boost Body Defences

**Pankaj Vohra**

*Max Super Specialty Hospital, Saket, New Delhi*

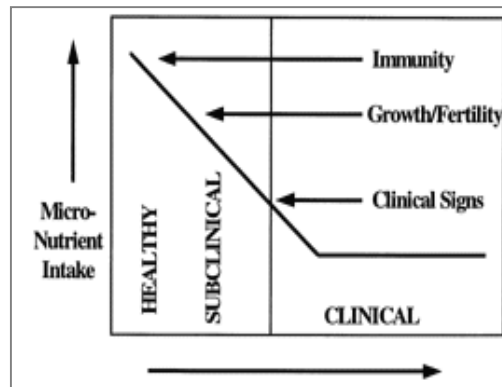
Human health and wellbeing depends upon an interaction between genetic endowment or constitution on one hand and environmental factors like nutrition, ecology (environmental sanitation, safe drinking water, pollutants, toxins etc) and life style (physical exercise, mental poise, peace, positive thinking, art of living, spirituality etc) on the other. Good nutrition and sound health go hand-in-hand. It has been known since the time of Hippocrates, that a person with good nutrition is able to ward off infections much more effectively than a person who is “fragile and weak”.

“Food is the breakthrough drug of 21st century.” – Jean Carper

Immune system not only combats infections but also reduces the risk of development of tumors, autoimmune and degenerative diseases. Both nutritional deficiency as well as excess may adversely affect various components of immune system<sup>1,2</sup>. Protein-energy malnutrition (including deficiency of certain amino acids) and deficiency of a large number of micronutrients (vitamins and minerals) can adversely affect the immunological status. During most of the 20th century, the focus of research in nutrition was how to improve intake of calories and

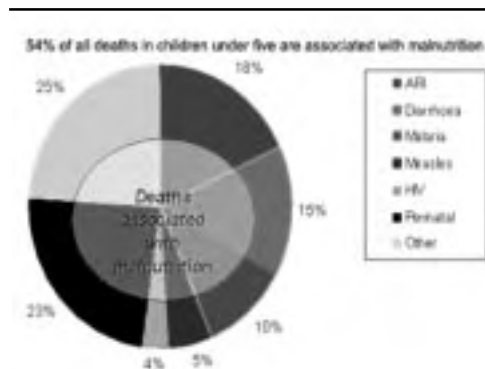
proteins in children. But of late, there has been an increasing awareness that subclinical or biochemical deficiency of certain micronutrients (“hidden hunger”) is widely prevalent in developing countries which is adversely affecting the quality of human life and is leading to frequent occurrence of common day-to-day gastro-intestinal and respiratory infections<sup>3</sup>. It has been documented that impaired immuno-competence due to nutritional deficiencies precedes overt infections and may even occur before growth failure is evident (Fig 1). It would appear that immunodeficiency is the earliest marker of suboptimal nutrition.

Malnutrition can have devastating effects on the antigen-specific arms of the immune system and innate host



**Fig 1. Micronutrients and Immunity**

defense mechanisms. Protein-energy malnutrition or deficiencies of single nutrients lead to atrophy of lymphoid tissues and dysfunction of cell-mediated immunity. The diseases associated with malnutrition and its effect on the percent mortality of children world wide is shown in Fig 2.



\* 54 % of all deaths are directly or indirectly associated with malnutrition – Source : <http://www.who.int/ceh/risks/otherisks/en/index1.html>. 2007.

**Fig 2. Causes of Deaths in Under-5 Children**

Infants and small children are at great risk of developing Nutritionally Acquired Immune Deficiency Syndrome (NAIDS) because they are equipped with immature, inexperienced immune system and have poor protein reserves. The combination of NAIDS and common infections in childhood is the leading cause of morbidity and mortality. In malnutrition, most of the host defense mechanisms are compromised, facilitating the microbes to invade the body and produce infections which may

take a fulminant or intractable course.

Acute infections are associated with anorexia, tissue catabolism and increased utilization of micronutrients thus leading to reduced levels of micronutrients which further compromises the nutritional status thus initiating a vicious cycle of undernutrition and recurrent infections.

### Malnutrition and Immodeficiency

Malnutrition is the most common cause of immunodeficiency worldwide

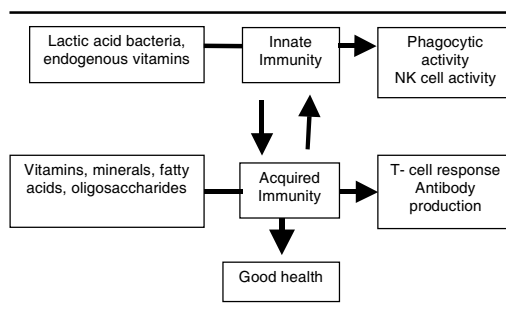
Immune cells require an adequate supply of trace elements like iron, iodine, selenium, zinc and manganese for the integrity of cellular structure and functioning of metalloproteins that participate in housekeeping processes. It is recognized that antioxidants play an important role in all aspects of the immune responses like phagocyte function, cytokine production, cell-mediated responses, and immunoglobulin production. Minerals and vitamins interact and complement each other thus facilitating immunocompetence at all levels.

### Micronutrient Malnutrition

Micronutrient malnutrition (“Hidden hunger”) is a major public health problem in India.

The data on the Diet Surveys of India show the high prevalence of micronutrient deficiencies such as iron, calcium, vitamin A and vitamin B complex in a large percentage of

populations. Micronutrient malnutrition (particularly of iron, vitamin A and iodine) is a major public health problem in India.<sup>4</sup> Several foods can, greatly modulate the immune functions and a balance of innate and acquired immunity is desirable for maintenance of good health as illustrated in Fig 3.



**Fig 3. Modulation of Immune Functions by Foods**

### Role of Vitamins in Immunity

Vitamin D has beneficial effects on human immunity. It acts as an immune modulator, preventing excessive expression of inflammatory cytokines and increasing the 'oxidative burst' potential of macrophages. Vitamin D stimulates the epithelial cells lining the respiratory tract and protects the lungs from infection thus reducing the incidence of respiratory tract infections in children.<sup>5</sup>

Vitamin A supplementation reduces mortality and complications resulting from measles and diarrhea.

Vitamin A deficiency is prevalent world wide and is one of the leading cause of

malnutrition in children under the age of five years. Supplementation of vitamin A to preschool children is known to decrease the risk of morbidity and mortality from some forms of diarrhea, measles, human immunodeficiency virus (HIV) infection, and malaria. Vitamin A is useful for prevention and treatment of acute diarrhea. A positive effect among HIV-infected children is also observed which may be related to increased T-cell lymphopoiesis.<sup>6</sup> Under certain circumstances, vitamin A supplementation to infants has the potential to improve the antibody response to some vaccines, including tetanus and diphtheria toxoids and measles. Its supplementation reduces mortality and complications resulting from severe measles. It has generated a great deal of interest and its effects on cellular differentiation, anti-tumorigenicity, and immune modulation are remarkable.

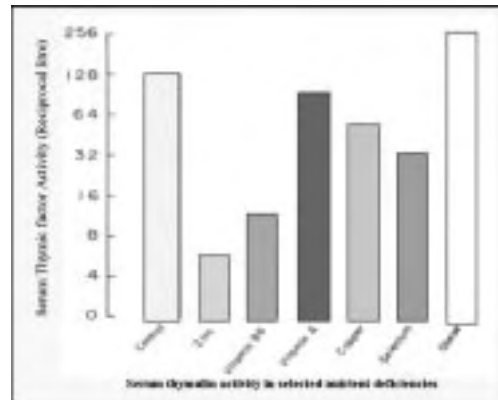
Vitamin C is helpful in prevention and treatment of respiratory tract infections. Vitamin C protects cells against reactive oxygen species generated during the respiratory burst and in the inflammatory response. Supplementation of vitamin C has been found to improve components of the human immune system such as antimicrobial and natural killer cell activities, lymphocyte proliferation, chemotaxis, and delayed-type hypersensitivity. Adequate intakes of vitamin C and zinc ameliorate symptoms and shorten the duration of respiratory

tract infections including common cold. Furthermore, vitamin C and zinc reduce the incidence and improve the outcome of pneumonia, malaria, and G I infections, especially in children.<sup>7</sup>

### Role of Minerals in Immunity

Zinc is an important component of several metalloenzymes involved in DNA synthesis and repair, red cell integrity, bone and liver metabolism, and multiple dehydrogenase and carboxypeptidase reactions. Zinc supplementation significantly lowered the incidence of diarrhea and pneumonia<sup>8, 9</sup>. Zinc supplementation has been shown to reduce the mortality of malaria due to *P falciparum*. Adjunct therapy with zinc during acute shigellosis significantly improved seroconversion to shigellacidal antibody response and increased the proportion of circulating B lymphocytes and plasma cells. Thymulin is a zinc-binding nonapeptide secreted by thymic epithelial cells that requires zinc to promote extrathymic maturation of T-lymphocytes.<sup>10</sup> The effect of single nutrient deficiency on serum thymic hormone activity is illustrated in Fig 4. Research over the last 15 years has clearly shown the benefits of using pharmacological doses of zinc in all forms of diarrhea. Use of zinc in diarrhea has been endorsed by IAP and WHO.

**Selenium-dependent enzymes are useful in modulating the immune system.**



**Fig 4 Serum Thymulin Activity in Selected Nutrient Deficiencies**

Selenium has synergistic effects with vitamin E and vitamin C – therapeutic strategy against lung cancer.

Selenium is a trace mineral with important antioxidant properties. Histamine and selenium can be used in protective and therapeutic strategies.<sup>11</sup> Selenium-supplementation in patients with adult respiratory distress syndrome showed a significant improvement in relation to length of hospital stay, risk of infection and need for hemodialysis.<sup>12</sup> There is evidence to suggest that myocarditis due to Coxsackie virus (Keshan disease) is aggravated by dietary deficiency of selenium. Selenium-dependent enzymes are important for modulating the immune system and improving the clinical outcome of patients. Evidence suggests that selenoproteins play an important role in the immunomodulation of critically ill patients and a sodium selenite supplementation upregulates these

selenoenzymes.<sup>13</sup>

Micronutrient - fortified beverage reduce the duration of common illnesses.

Folate improves proliferative response to mitogens, distribution of T cells in the mesenteric lymph nodes and the age-related changes in cytokine production in the spleen. Dietary folate requirement may be higher in the older population than in the younger population to support immune functions.<sup>14</sup>

Anemia increases the risk of infections.

Iron helps in the prevention of anemia and its deficiency has been found to be

a risk factor for susceptibility to infections. In children, iron deficiency is associated with decrease of *in-vitro* production of interleukin-2, conceivably affecting cell-mediated immunity and T-cell dysfunction.<sup>15</sup> Iron supplementation significantly improves iron status and reduces morbidity from upper respiratory tract infections.<sup>16</sup>

Nutrient deficiencies have been demonstrated to have adverse effects on many immune functions. Table 1 summarises the adverse immunological effects due to deficiency of various macro and micronutrients.

Table 1. Immune defects in various nutrient deficiency states

Clinical characteristics	Primary nutrient deficiency	Associated nutrient deficiency	Immune system	Immune response
Wasting, stunting, ↓ weight for height, nongenetic short stature	Protein calorie deficiency (marasmus)	Zinc, magnesium, selenium, copper, iron, vitamin A	Thymic atrophy, ↓lymph nodes, ↓tonsils, Tcells, and ↑IgA, IgG is normal or ↑	↓Skin test reactivity; ↓cytokine response; may respond to vaccines; increased risk of bacterial, viral, parasitic, opportunistic infections
Moon face, edema, apathy, ↓ muscle mass, hepatomegaly, anemia	Protein deficiency (Kwashiorkor)	Zinc, magnesium, selenium, copper, iron, vitamin A	Altered T-cell subsets, ↑ IgA, IgG is normal or elevated	↓Skin test reactivity; ↓cytokine response; may respond to vaccines; increased risk of bacterial, viral, parasitic, opportunistic infections

Table 1 continued on next page

Table 1 continued from previous page

Clinical characteristics	Primary nutrient deficiency	Associated nutrient deficiency	Immune system	Immune response
Diarrhea, skin lesions, infections, alopecia, poor wound healing	Zinc	Rarely iron, copper	Lymphopenia, thymic atrophy, altered T-cell subsets	↓Skin test reactivity, ↓cytokine response
Anemia, pallor, spoon-shaped nails, pica, infections	Iron	Zinc	T-cell defects, ↓ IgG levels, ↓ phagocytic activity	?Cytokine response, increased risk of parasitic and opportunistic infections due to candida species
Neutropenia, anemia	Copper	↑ Zinc (might be causative)	Lymphopenia	Reduced IL-2 response
Muscle aches and pains, cardiomyopathy, recurrent infections	Selenium	Not reported	↓ Antioxidant defense	Increased severity of viral infections
Xerophthalmia, keratomalacia, diarrhea and respiratory tract infections	Vitamin A	Zinc	Lymphopenia, ↓mucosal barrier function	↓ T-cell response, especially TH2, ↓ phagocytic cell and NK cell functions
Neurologic symptoms, atopic disease with ↑ IgE	Vitamin E	Selenium	↓Antioxidant defense, ↑ IgE levels	↑PGE <sub>2</sub> production, enhanced viral virulence
Scurvy, purpura, petechiae, hyperkeratotic skin lesions, recurrent furunculosis, stress ulcers	Vitamin C	Not reported	↓Plasma glutathionine	↓Phagocyte function, increased risk of infections

PGE<sub>2</sub> = Prostaglandin E<sub>2</sub>.

Adapted from Cunningham-Rundles S, McNeely DF, and Moon A. Mechanisms of nutrient modulation of the immune response. *J Allergy Clin Immunol* 2005; **115**: 1119-28.

### Evidence in Favor of Nutrient Supplementation

A study conducted by the National Institute of Nutrition, Hyderabad<sup>17</sup> brought out the fact that even healthy Indian children living in semi-urban areas with intake of adequate food had subclinical micronutrient deficiency. This was a double blind- placebo controlled study in 869 semi-urban middle-class apparently healthy residential school children aged 6-16 years who were randomly assigned to receive either a micronutrient fortified beverage (n= 446) or placebo ( n=423). It was observed prior to supplementation that the biochemical status of micronutrients like iron, vitamin A, folic acid, vitamin B<sub>2</sub> and vitamin B<sub>12</sub> was deficient in over 50 % children.

These children were supplemented with micronutrient-enriched beverage for 14 months and biochemical parameters

such as hemoglobin, ferritin, calcium, phosphorus, parathyroid hormone (PTH), urinary iodine, triiodothyronine (T<sub>3</sub>), thyroid-stimulating hormone (TSH), albumin, zinc, vitamins A, C, D, B<sub>1</sub>, B<sub>2</sub>, B<sub>6</sub>, and B<sub>12</sub>, and folic acid were measured, after conclusion of the study.

Micronutrient supplementation reduces the duration of common illnesses like respiratory infections, gastroenteritis and fever.

There was significant improvement in the status of many of the nutrients, the effect was most significant with respect to vitamins A, B<sub>2</sub>, B<sub>12</sub>, folic acid, vitamin D, parathyroid hormone, and thyroid-stimulating hormone in supplemented group in comparison with placebo group (Fig 5.) In children with anemia, supplementation significantly improved the hemoglobin status. This shows that bioavailability of nutrients from the typical Indian diet is an issue and hence there

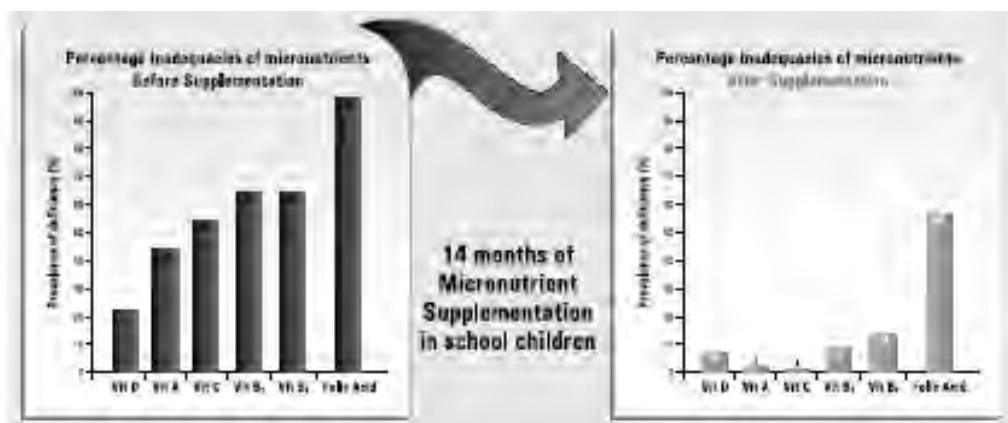


Fig 5- Increase in biochemical indicators after supplementation

is a need for a nutritional supplement with “bioavailable micronutrients”.

Another significant observation made in the course of study was that supplement with a micronutrient-fortified beverage in healthy children reduces the duration of common illnesses like respiratory infections, and gastroenteritis<sup>17</sup> (Fig 6). It would appear that the supplement with micronutrient fortified beverage improves the nutritional status of a child, thus helping to boost the immune system.

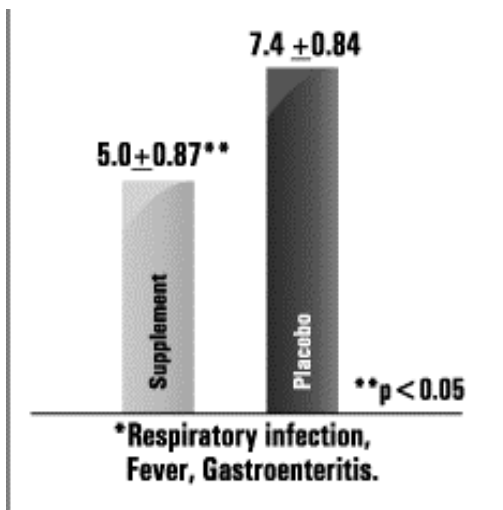


Fig 6. Mean Duration (days) of Illness\* in Affected Children

### Conclusions

Inadequate macronutrients or deficiency of selected micronutrients, especially zinc, selenium, iron, folate and the antioxidant vitamins like vitamin A,

vitamin C and vitamin D can lead to clinically significant immune deficiency with increased risk of infections in children as well as in adults. Infections are more common and are likely to become chronic in the malnourished child. Micronutrient deficiency and chronic undernutrition adversely affect cytokine response and indirectly immune cell trafficking. The combination of chronic infection and undernutrition weakens the immune response. Although dietary requirements of most of the micronutrients are met by a balanced diet, there are certain vulnerable population groups and specific disease states which are likely to be associated with deficiency of one or more of these essential nutrients.

Malnutrition in childhood has long-term effects on health which may adversely influence their physical and mental performance in a highly competitive world of today. Micronutrient malnutrition may diminish their motivation and curiosity thereby reducing their exploratory activities both during play and at school. A few recent studies have also shown that the micronutrient-fortified beverage may be a useful and convenient preventive measure, one that could help improve the nutritional status and thus prevent the adverse consequences of micronutrient deficiencies in children<sup>18, 19</sup>.

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### Membership Form of IAP Chapter on Growth, Development and Behavioral Pediatrics

1. Name :

Surname.....Firstname.....Middlename.....  
(use Block Letter)

2. Male  Female

3. Central IAP Membership No.....

4. IAP Non Member (Phychiatrist/Phychologist/Counselor/Teacher) :.....

5. Corresponding Address :.....

6. Designation in Institute with its Name (If any) .....

7. Academic Qualification (s) :.....

8. Phone No. Residence :.....Office/Chamber :.....

9. Fax No. :.....10. Email :.....

11. Date of Birth :.....

12. Bank Draft/Cheque No.:..... Name of Bank.....

Branch.....Amount.....

Cash.....

Date :

Signature

**Send it to : The Secretary, IAP GDBP Chapter**  
P 889 Block A, Lake Town,Kolkata 700 089