FAILURE TO THRIVE

Sqn Ldr V VENKATESHWAR^{*}, Gp Capt TS RAGHU RAMAN⁺

ABSTRACT

Failure to thrive is a commonly encountered problem in Paediatric practice. This essentially generic term refers to children whose attained weight or rate of weight gain is significantly below that of other children of similar age and same sex. Several defining criteria have been proposed and help to differentiate true failure to thrive from other conditions causing apparent growth failure. There are numerous organic causes of failure to thrive, but non-organic failure to thrive is also an important entity and is caused by social, psychological and environmental factors. The clinical features are those of malnutrition, signs of underlying organic cause and specific manifestations of environmental/psychosocial deprivation. Indiscriminate laboratory investigations are usually non-contributory and have no role in evaluation. Management requires a multidisciplinary approach and hospitalization has a specific role. Although nutritional rehabilitation is the cornerstone of therapy, treatment of underlying factors-medical, psychological, social and environmental-should receive equally important attention. Long term physical, developmental and behavioural sequelae are known to occur in children with failure to thrive.

MJAFI 2000, 56 : 219-224

KEY WORDS: Failure to thrive; Growth failure; Non-organic failure to thrive; Nutritional rehabilitation;

Introduction

The word 'thrive' is defined by New Webster's Dictionary as to grow and function well; to have good health. The term 'failure to thrive' was mentioned as early as 1915 by a distinguished American Paediatrician, Dr Henry Dwight Chapin of New York who was a pioneer in alerting paediatricians to failure of growth and development associated with poverty and with contemporary institutional care of infants and young children [1]. Failure to thrive is the term applied to a condition where a child's growth rate fails to meet the potential expected for a child of that age [2]. It is simply a descriptive term rather than a diagnostic label, which collectively describes the end results of a great number of different conditions [3].

Historically the term has primarily been used to describe failure to gain weight resulting from caloric or maternal deprivation or both. Any serious disease can cause growth failure, but failure to thrive usually implies that the cause is not immediately apparent. Today, there is a re-think on this nomenclature and it has been suggested that it be replaced by other generic term such as 'growth failure' or 'failure to gain weight', or with a specific etiological diagnosis [3]. Some opine that the term 'failure to gain weight appropriately' should be adopted, or behaviour criteria be included in the definition of failure to thrive [4].

Definition

Various criteria have been used for defining failure to thrive and some of these are as follows [5]:

1. *Based on attained growth*
 - a) Weight less than 3rd percentile on NCHS growth chart.
 - b) Weight for height less than 5th percentile on NCHS growth chart.
 - c) Weight 20% or more below ideal weight for height.
 - d) Triceps skin-fold thickness less than or equal to 5 mm.
2. *Based on rate of growth:*
 - a) Depressed rate of weight gain:
 - i) <20 gm/day from 0-3 months of age.
 - ii) <15 gm/day from 3-6 months of age.
 - b) Fall off from previously established growth curve:
 - i) Downward crossing of more than or equal to two major percentiles on NCHS growth chart.
 - ii) Documented weight loss.

Theoretic body weight has been proposed as an index of failure to thrive [3]. It is defined as the weight that the child should have had at the time of admission if he had continued to gain weight along the previously established percentile during the pre-morbid period. Crossing more than one channel of growth (percen-

^{*} Graded Specialist (Paediatrics), 7 Air Force Hospital, Kanpur 208 004. ⁺ Senior Adviser, Department of Paediatrics, Command Hospital (Air Force), Bangalore 560 007.

tile) or the loss of 10% of an infant's body weight is evidence of failure to thrive. Using this method, nutritional growth problems may be detected even when there is no body weight deficit for length and even when there is weight excess.

Incidence

The prevalence of failure to thrive in the general population is not exactly known and depends upon the population sampled. Western literature reports a prevalence of 8% in paediatric population [6]. Mitchell et al reported that 3-5% infants less than 1 year admitted to hospital have failure to thrive [7]. Berwick has attributed failure to thrive for 3-5% of admissions to paediatric hospitals [8]. However, growth failure is more common in out-patient settings [2].

Failure to thrive is rampant in our country manifesting as various grades of malnutrition. It is estimated that 40% of our population is affected by mild to moderate malnutrition and according to an ICMR study (1986), only 5% of pre-school children had normal body weight for age; 41% had mild malnutrition; 47% moderate and 7% had severe malnutrition [9]. About one-quarter of all admissions of infants and children in Indian hospitals is on account of malnutrition [10]. Failure to thrive is more common during the first two years of life and during the early teens when the growth rate of a child is at its greatest [11].

Classification

Failure to thrive has traditionally been classified into two categories: Organic and Non-organic failure to thrive (NOFTT). Non-organic failure to thrive or psychosocial failure to thrive refers to failure to thrive in a child who is younger than 5 years age and has no known medical condition that causes poor growth. It is caused by emotional deprivation, child abuse, neglect or due to accident. The incidence of non-organic failure to thrive amongst children with failure to thrive has been variously reported in Western literature as 32% [12], 41% [13] and 50% (in hospital patients) [11]. The source of study population however must be considered, since in a referral centre, it is more likely that organic causes of failure to thrive will constitute a large percentage while in a primary care setting the great majority will have non-organic failure to thrive. There is paucity of Indian studies on incidence of non-organic failure to thrive vis-a-vis organic failure to thrive. However, it may be reasonable to assume that organic causes of failure to thrive may be more common in our country, as compared to developed countries. Mathur, et al investigated 100 children between

3-36 months of age with failure to thrive at under-five clinic. Of these children, 52% had pulmonary TB, 32% had UTI and rest had other causes; thus highlighting the need to look for causes other than nutritional in children who have growth faltering/failure to thrive in early childhood [14].

Etiology

Failure to thrive results from a variety of causes, the list of which virtually encompasses an entire textbook of Paediatrics. These causes may be classified as depicted in Table-1 [5].

TABLE 1
Etiology of failure to thrive

-
1. Inadequate intake :
a) Poverty
b) Misperceptions about diet and feeding practices
c) Inadequate breast milk production
d) Errors in formula reconstitution
e) Dysfunctional parent child interaction :
i) Behavioural feeding problem
ii) Neglect
iii) Child abuse
f) Mechanical problems with sucking, swallow, feeding :
i) Primary neurological disease
ii) Chromosomal abnormality
iii) Pre natal insult
g) Systemic disease resulting in anorexia / food refusal
2. Caloric wasting
a) Persistent vomiting
i) Gastro esophageal reflux
ii) Gastro intestinal obstruction
iii) Rumination
iv) Metabolic problems
v) Increased intracranial pressure
b) Malabsorption and/or chronic diarrhea
i) Primary gastro intestinal disease
ii) Cystic fibrosis
iii) Infections
iv) Endocrinopathies
v) Structural problems
c) Renal losses
i) Diabetes
ii) Renal tubular acidosis
3. Increased calorie requirements
a) Congenital heart disease
b) Chronic respiratory disease
c) Neoplasm
d) Hyperthyroidism
e) Chronic or recurrent infections
4. Altered growth potential / regulation
a) Pre-natal insult
b) Chromosomal abnormality
c) Endocrinopathies
-

Whether the condition is primarily organic or psycho-social in origin, all children who are failing to thrive suffer from a serious organic insult-primary malnutrition. They suffer the physical and psychological consequences of malnutrition and are at a significant risk for long-term physical and psycho developmental sequelae [5]. Thus the approach to the child with apparent growth failure has shifted away from attempts to define a purely organic or non-organic etiology towards evaluation of diagnostic and therapeutic implications of nutritional, medical, psychosocial and developmental factors.

Identification of failure to thrive

The first issue to be addressed when faced with a child who is not growing well is whether or not the child is truly failing to thrive. This is so because there are several causes of factitious failure to thrive [3] which include familial short stature, constitutional growth delay and intra uterine growth retardation.

It is propounded that since the size of infant at birth is related more to maternal size and intra-uterine influences than to genetic factors, in some children an adjustment of growth velocity between birth and two years age is to be expected [3]. Thus a significant decrease in growth rate may represent a physiological event in the first 2-3 years of life and does not necessarily indicate failure to thrive [15]. In this context some advocate that maximum weight centile achieved between 4-8 weeks is a better predictor of centile at 12 months than is the birth weight centile [16], thereby making it an important yardstick in evaluation of failure to thrive.

Estimation of mid parental height and repeated growth assessment help in differentiating familial short stature from failure to thrive. Constitutional growth delay is identified by a positive family history with equally delayed height age and skeletal age with respect to chronological age. Intra-uterine growth retardation should also be distinguished from true failure to thrive.

Another factor for factitious failure to thrive is to correct for pre-maturity. The chronological age should be corrected for pre-maturity until 18 months for head circumference; until 24 months for weight and until 40 months for height.

Thus to identify true failure to thrive, a review of the child's past and present growth data for deviation from population norms, consistency over time and concordance between growth parameters should be done.

Clinical manifestations

Once it has been identified that the child is truly failing to thrive, the paediatrician must ascertain whether this is due primarily to inadequate calorie intake, calorie wasting or an increased calorie requirement.

A good comprehensive history-medical, dietary, social, behavioural and developmental is vital for evaluation of failure to thrive.

Inadequate calorie intake can be determined by the dietary history. The results of a 24-hour dietary recall and a 7-day food frequency should be obtained and evaluated for adequacy of calories, proteins and micronutrients [2].

Medical conditions associated with caloric wasting and increased caloric requirement (as listed) are usually suggested by their specific symptoms.

The physical examination of a child with failure to thrive should focus on:

- a) Severity of malnutrition.
- b) Signs of underlying organic disease.
- c) Important concomitant findings such as physical abuse/neglect or the presence of deprivational behaviour.
- d) Observation of parent-child interaction especially during feeding.
- e) Developmental assessment.

Organic disease presenting only with growth failure is extremely uncommon [5] and specific signs are usually manifest.

Various clinical features suggestive of environmental/psychosocial deprivation as a cause of failure to thrive have been described. Avoidance of eye contact; absence of smiling or vocalisation; lack of interest in environment; negative response to cuddling; inability to be comforted; head banging; self-stimulatory activity (ano-genital manipulation); relative immobility with infantile posturing and inappropriately seeking affection from strangers [17]. Signs of neglect which may be noted are diaper rash, impetigo, poor hygiene [17] and flat occiput (a sign of being left unattended for many hours) [18]. Presence of fresh/healed bruises and unexplained scars are indicative of child abuse [17].

In infancy, many children with failure to thrive show developmental delays and abnormalities of posture and tone [2]. Therefore developmental assessment is necessary to measure the delay and act as a baseline for future progress [11].

Laboratory investigations

If the history or physical examination suggest any organic cause for failure to thrive, appropriate diagnostic tests should be carried out. There should be no such concept as 'Failure to thriveogram' [19]. An undirected laboratory evaluation rarely produces an unsuspected diagnosis and is potentially harmful [5]. Berwick et al in their study on failure to thrive noted that abnormal test results aided diagnosis in only 16% of their patients and only 39 out of a total of 4880 tests performed were helpful [12].

Similarly, in Sill's study of 185 children with failure to thrive, a total of 2607 laboratory studies were performed, but only 10(0.4%) of these studies established the diagnosis [20].

However, certain basic/screening tests which may be considered are shown in Table-2.

TABLE 2
Basic screening tests in failure to thrive

Complete blood count
Urinalysis
Stool examination
Serum electrolytes
X-ray chest
Serum creatinine
Serum proteins
Urine culture
Bone age
Mantoux test
HIV (Elisa)

To assess subtle malnutrition, certain sensitive tests like estimation of pre-albumin, retinol binding protein (RBP), IGF-1, fibronectin and ENKA (Erythrocyte sodium potassium ATPase) have found mention [3].

Management

An overall diagnostic and treatment plan based on trial of feeding in failure to thrive is depicted in Fig-1 [7].

Having identified failure to thrive in a child and assessed the probable cause of it, a decision to hospitalise or treat the child as an out-patient should be made.

Hospitalisation of children with failure to thrive is a contentious issue. The proponents feel that hospitalising a child provides an opportunity for quantifying factors governing the net calorie intake (Food intake, vomiting, stools) and for observing the child's interactions-especially during feeding and play-with parents, health personnel and other children. Hospitalisation

Fig. 1 : An overall diagnostic and treatment plan based on trial of feeding in failure to thrive

frequently leads to dramatic improvement in weight gain and in social responses and thus provides evidence that environmental factors are causative, eliminating the need for searching further for underlying organic disease [21].

An opposing viewpoint is that hospitalisation is rarely necessary and may be counter productive; day attendance for investigation and observation of child parent interaction may be more valuable [19]. Although weight gain during hospitalisation suggests evidence of non-organic failure to thrive and helps in differentiating from organic failure to thrive; failure to gain weight does not rule out non-organic failure to thrive. Also, separation of the child from family by hospitalisation may promote anxiety and anorexia in the child; cause delay in feeding and supporting the child in his/his environment [17].

A current view [6,22] is that decision for hospital admission should be based more on history than physical examination, especially if abuse or neglect is suspected or caretaker is seriously psychosocially impaired. In addition, physical findings of dehydration, serious malnutrition, traumatic injury hypothermia, haemodynamic changes etc warrant admission.

It is important to understand the parents perspective regarding their child's growth and health since they should be included in the treatment plan. Some may express feelings of guilt, inadequacy and anger when psychosocial problems are uncovered. Focussing on concern for the child's health and well being as well as

the positive goal of enhancing the parent-child relationship may help to diffuse some of these feelings [5]. Success of treatment depends upon establishment of a positive and caring longitudinal alliance with the child and caretakers.

Since a complex interaction of factors is at play in most situations, a multi-disciplinary team approach is needed in the management. Such a team consists of a paediatrician, a social worker, a nurse and a nutritionist with consultation as needed from specialists such as mental health professionals, physical and occupational therapists [2]. Uncontrolled studies on multidisciplinary treatment found improved growth within a year of diagnosis in roughly 50% of patients and stabilisation of growth in another 40% with about 10% showing deterioration [2].

Apart from immediate management of acute problems such as dehydration, shock, renal failure, sepsis, hypothermia and dyselectrolytemia; nutritional rehabilitation is the mainstay of treatment. The goals of nutritional therapy in children with failure to thrive are [3]:-

1. Achievement of ideal weight for height and correction of nutritional deficiencies.
2. Allowance for catch up growth.
3. Restoration of optimum body composition.
4. Parental education in nutritional requirement and feeding of child.

Table-3 depicts guidelines for correction of certain nutritional deficiencies in malnutrition.

TABLE 3
Nutritional requirements in deficiency states

Calories	150 - 200 kcal/kg
Proteins	4 - 5 g/kg
Vitamin A	2 lakh units (Day 1, 2 and 14)
Folic acid	5 mg/day
Vitamin D	2000 - 4000 IU/day
Iron	3 - 6 mg/kg
Zinc	10 - 15 mg/day
Magnesium	0.2 - 0.5 mEq/kg
Potassium	2 - 4 mEq/kg

While providing calories and proteins, the principle of starting with frequent small feeds and gradually increasing the volume and calorie density should be adhered to. Initially nasogastric tube feeds may be required in a sick and severely malnourished child who cannot consume orally. Subsequently oral feeding should proceed as the child demands. Vitamin and mineral deficiencies should be corrected. Depending on the severity of initial deficit, 2 days to 2 weeks of

re-feeding are generally required to initiate catch up growth. Accelerated growth must then be maintained for 4-6 months to restore a child's weight for height [2].

Needless to mention, an organic cause if detected should receive prompt and appropriate treatment concurrently.

Management of the child with psychosocial problems must be individualised to the specific needs of the child and family. Correction of potential misinformation and helping to implement specific feeding guidelines and addressing the psychosocial needs of the family are some of the measures [5].

Temporary or permanent placement in a foster home may be necessary in some cases [21].

In our country, poverty and illiteracy are the main factors among the varied underlying problems for which intervention by medical, social and administrative authorities on a long term basis is necessary. Health education of parents and creating awareness about feeding practices plays a very important role in our country where ignorance is a major factor in causation of failure to thrive. In this respect non-formal education has been emphasised as an important objective of Indian Academy of Paediatrics.

Prognosis

The prognosis of children with failure to thrive depends on severity and duration of malnutrition, associated complications; the underlying etiology; specific environmental and psychosocial factors involved in a given child and the response to treatment.

Normal head circumference and brain growth may not be achieved if marasmus has persisted beyond 6 months of age [18]. Children hospitalised for failure to thrive in infancy have been reported to continue to have depressed psychomotor scores and high rates of school failure during pre-school and school years [23]. Reif et al in a long term follow up at 5 years of age of infants with non-organic failure to thrive found that the study group children are shorter; gain less weight; have more learning difficulties and evidenced developmental delay [24]. In children with failure to thrive, other likely long term problems can be development of neurotic or anti-social traits; reading problems; poor verbal development; persisting inadequate growth and development; and even death under suspicious circumstances [21].

REFERENCES

1. Goldbloom RB. Failure to thrive. *Paed Clin North Amer* 1982;29:151-66.

2. Frank DA, Zeisel SH. Failure to thrive. *Paed Clin North Amer* 1988;35:1187-1206.
3. Maggioni A, Lifshitz F. Nutritional management of failure to thrive. *Paed Clin North Amer* 1995;42:791-810.
4. Anonymous. Failure to thrive revisited. *Lancet* 1990;336:662-3.
5. Overby KJ. failure to thrive. In: Rudolph AM, Hoffman JIE, Rudolph CD, eds. *Rudolph's Paediatrics*, 20th ed, Prentice Hall International Inc. 1996;5-7.
6. Headley RM, Lustig JV. Growth deficiency (failure to thrive) In: Hay WW Jr, Groothuis JR, Hayward AR, Lewin MJ, eds. *Current Paediatric diagnosis and treatment*, 13th ed. Prentice Hall International Inc 1997;232-2.
7. Mitchell W. Failure to thrive-Study in primary care setting. *Paediatrics* 1980;65:9 61-77.
8. Berwick DM. Non-organic failure to thrive. *Paediatric Rev* 1980; 1:265-70.
9. Ali A. Nutrition. In: State of India's health. Voluntary Health Association of India 1992:14.
10. *Paediatrics Today: An overview*. In: Gupte S, ed. The short textbook of Paediatrics. 7th ed. Jaypee Brothers 1995:1-21.
11. Bisset WM. Failure to thrive. In: Campbell AGM, McIntosh N, ed, Forfar & Arneil's Textbook of paediatrics. 5th ed, Edinburgh: Churchill Livingstone 1998:465-9.
12. Berwick DM, Levy JC, Kleinerman R. Failure to thrive: diagnostic yield of hospitalisation. *Arch Dis Child* 1982;57:347-51.
13. Homer C. Categorisation of etiology of failure to thrive. *Am J Dis Child* 1981;135:848-51.
14. Mathur R, Kumari S, Mullick DN. Failure to thrive. Abstracts of 23rd Annual conference of Indian Academy of Paediatrics. *Indian Paediatrics* 1986;23:886.
15. Porter B, Skuse D, Edwards AGK. When does slow weight gain become failure to thrive? *Arch Dis Child* 1991;66:905-6.
16. Edwards AGK, Halse PC, Parkin JM, Waterson AJR. Recognising failure to thrive in early childhood. *Arch Dis Child* 1990;65:1263-5.
17. Kirkland TR. Failure to thrive. In: Frank Oski, Angelis De, Feigin, Mc Milan, Warshaw, eds. *Principles and practice of Paediatrics*. 2nd ed. Philadelphia. JB Lippincott Co 1994:1048-51.
18. Johnson CF. Non-organic failure to thrive. In: Behrman RE, Kleigman RM, Arvin AN, eds. *Nelson Textbook of Paediatrics*. 15th ed. WB Saunders Co 1996:119-20.
19. Marcovitch H. Failure to thrive. *BMJ* 1994;308:35.
20. Sills RH. Failure to thrive: the role of clinical and lab evaluations. *Am J Dis Child* 1978;132:967-9.
21. Bauchner H. Failure to thrive. In: Behrman RE, Kleigman RM, Arvin AM, eds. *Nelson textbook of paediatrics*, 15th ed. WB Saunders Co 1996:122-3.
22. Gahagan S, Holmes R. A stepwise approach to evaluation of undernutrition and Failure to thrive. *Paed Clin North Amer* 1998;45:169-87.
23. Hufton IW, Oakes RK. Non-organic failure to thrive: A long term follow up. *Paediatrics* 1977;59:73-6.
24. Reif S, Beler S, Villa Y, Spitzer Z. Long term follow up and outcome of infants with non organic failure to thrive. *Isr J Med Sci* 1995;31:438-9.