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Review Article

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How to Improve Eating Behaviour during Early Childhood

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Eating behaviour disorder during early childhood is a common pediatric problem. Many terminologies have been used interchangeably to describe this condition, hindering implementation of therapy and confusing a common problem. The definition suggests an eating behaviour which has consequences for family harmony and growth. The recent Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition does not cover the entire spectrum seen by pediatricians. Publications are substantive but level of evidence is most of the time low. This purpose of this review is to clarify terminology of eating behaviour problems during early childhood; including benign picky eating, limited diets, sensory food aversion, selective eating, food avoidance emotional disorder, pervasive refusal syndrome, tactile defensiveness, functional dysphagia, neophobia and toddler anorexia. This tool is proposed only to ease the clinical management for child care providers. Diagnostic criteria are set and management tools are suggested. The role of dietary counselling and, where necessary, behavioural therapy is clarified. It is hoped that the condition will make its way into mainstream pediatrics to allow these children, and their families, to receive the help they deserve.

Key Words: Eating behaviour disorders, Eating disorders, Picky eater, Early childhood, Meals

INTRODUCTION

The eating process is of importance for survival and health. Eating disorders have been adequately addressed and discussed in adults and adolescents with many randomized controlled trials and system-

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atic reviews. They have been classified in Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM5) [1]. By contrast, eating behaviour of early childhood, a common problem for pediatric practitioners, is a topic without clarity. Moreover, in DSM5 [1] both "Other Specified Feeding or Eating Disorder, 307.59" and "Unspecified Feeding or Eating Disorder 307.50" cannot adequately explain many of the problems observed during early childhood. The chapter on eating disorders of infants and early childhood was replaced in DSM5 by "Avoidant/Restrictive Food Intake Disorder: 307.59" but it was not analysed in sufficient detail to help plan a therapeutic approach. The picky eater category was not included, considering it a non-mental problem. This confusion can be attributed to lack of agreement on the terminology used, little available original research and possible psycho-behavioural and organic, multifactorial nature of this problem. The aim of this review is to evaluate the publications and opinions in the context of the disorder and in light of the available levels of clinical evidence.

The terminology "eating behaviour disorder of early childhood" which we introduce includes conditions such as picky eating [2], limited diets, sensory food aversion [3], selective eating [4], food avoidance emotional disorder [5], pervasive refusal syndrome [6], tactile defensiveness [7], neophobia [8] and toddler anorexia [9]. This tool is proposed to ease the clinical management for child care providers. The DSM5 classification of "Avoidant/Restrictive Food Intake Disorder: 307.59" will overlap with eating behaviour of early childhood as the former includes all age groups and the latter will include other disorders excluded in the former group.

METHODOLOGY

An exhaustive search of Pubmed for the last 20 years was conducted. Keywords used included "childhood feeding" and "childhood eating (problems, disorders or difficulties)". All works were retrieved and their level of evidence and quality was determined (Table 1) [10]. The most valid and recent literature was used in this review.

DEFINITION

The proposed definition of eating behaviour disorders of early childhood states "a condition that imposes a short-term eating behaviour of the child with possible risk of long-term health consequences" (Table 2) [11]. These effects are important for both child and family. Wherever possible, the definition builds on the definitions used in the many conditions described above [1-9].

PREVALENCE

Based on the previous definition, eating behaviour disorders of early childhood are a common chronic

Table 1. Evidence Level and Quality

Evidence quality	Definition
A	Well-designed RCTs or diagnostic studies on relevant well-chosen population
B	Minor limitations in RCTs or diagnostic studies or very clear and consistent evidence from observational studies
C	Observational studies (cohort or case control)
D	Expert opinion, case series or reports, reasoning from first principles

RCT: randomized controlled trial.
Modified from American Academy of Pediatrics Steering Committee on Quality Improvement and Management (Pediatrics 2004; 114:874-7) with permission [10].

Table 2. Definition of Eating Behaviour Disorder of Early Childhood

Criteria include one or more of the following three pillars [11]:
- Loss of interest in food (a behavioural disturbance at meal times)
- Neophobia (a tendency to refuse new and/or certain foods)
- Strong food preferences limiting quantity or variety of food intake

Prerequisites to fulfil this definition include the concern of the caregiver, need for evaluation of the risk of growth faltering and nutritional deficiencies (macro- and micro-elements) and/or family disharmony.

condition and prevalence rates vary from 13% to 22% or 13% to 50%, depending on age and various definitions [12,13].

RISK FACTORS

Many risk factors that predispose to eating behaviour disorders of early childhood (Table 3) [14-24]. Risk identification may provide a clue to early intervention.

DIAGNOSIS

A high index of suspicion for the diagnosis of eating behaviour disorders of early childhood should be raised if one or more of the following factors are present:

1. Parents are concerned about an abnormal established eating behavior that is related to diet or meal time regarding [12,25,26] (level of evidence: B): content (avoidance/preference), quality, texture/color, duration (slow/incomplete), unpleasant, messy, behavioral abnormalities
2. Health care worker identified consequences where objective history and examination of the child reveal [14,27,28]: growth faltering (B), micro-nutrient deficiency (C), obesity (B), behavioral disorders (B), chronic illness (C), sleep disturbance (B), anemia (C), constipation (C), family disharmony (B)
3. Occurs at any age (usually after the age of 2 years) in which a child independently begins to eat and is usually present for more than one month [14]
4. Not related to food availability due to poverty or food insecurity
5. Thorough clinical evaluation excluded a significant underlying organic disease that may, on its own, produce micro- or macro-nutrient deficiencies

Questionnaires to identify eating behaviour disorders of early childhood have been developed [15]. In making an assessment of a child with an eating behaviour disorders of early childhood it is important to assess food quality and quantity (consumption) and behavior during meals and to perform a thor-

Table 3. Risk Factors for Eating Behaviour Disorder Early Childhood

Risk factor	Evidence level
Genetic predisposition [14]	C
Early feeding difficulties (such as frequent colic, frequent vomiting and slow feeding or sucking difficulties) [15]	C
Birth rank in family (more common in first child) [16]	B
Small for gestational age infants [17-19]	B
Absence of exclusive breast feeding in early life [20]	B
Delayed introduction of solids beyond 9 months [21]	
Improper weaning practices [14]	B
Improper early feeding practices (such as little variation and texture variety in diet, too few new foods being offered and poorly structured meal time and practice) [14]	B
History of previous significant medical illness [22]	B
Disturbed sleep patterns in the child [23]	C
Conflict between care giver and child at meal time [14]	C
Maternal history of anxiety, eating problems and body image concern (occasionally also paternal disorders) [24]	B

Table 4. Assessment Form for a Child with a Suspected Eating Behaviour Disorder Early Childhood

Food consumption:
- Total food quantity as assessed by a dietary recall
- Textures, colors, temperature of food
- Selective food intake or variety
- Frequency of exposure to new foods
- Food group types in relation to the food pyramid

Behavior during meals:
- Duration of meal times (in keeping with family norms)
- Meal time schedules
- Participation in family meal times

Outcomes:
1. Anthropometry (weight, height, weight for height, body mass index)
2. Energy/activity level
3. Trace element and vitamin deficiency risk (especially clinical assessment and in some cases where concerned laboratory assessment may be required)
4. Bowel habits
5. Intelligence quotient
6. Milestones
7. Immunity as assessed by frequency of minor infections
8. Vision assessed by an ophthamologist
9. Sleep patterns

ough examination of the child. Some important elements of assessment are listed in Table 4.

CONSEQUENCES AND PROGNOSIS OF EATING BEHAVIOUR DISORDERS OF EARLY CHILDHOOD

The condition is, in some cases, not benign and if left untreated may result in a number of consequences such as anorexia, growth disturbance, conduct disorders, food preferences into adulthood and, importantly, macro- and micro-nutrient deficiencies [13,14].

DIFFERENTIAL DIAGNOSIS

Although eating behaviour disorders of early childhood is proposed as a specific entity in this context, it should be remembered that many conditions may cause disordered eating such as cow's milk protein allergy and medication side effects [29].

Co-morbidities may include other behavioral problems especially around meal times, including messiness, poor manners, foul language and lack of attention.

Specific neurological or psychological disorders that form their own syndrome may overlap with eating behaviour disorders of early childhood but are not a natural extension of this specific syndrome. These may include pervasive developmental disorder, attention deficit disorder, conduct disorders and sensory integration disorder [30]. However, some chronic illnesses do not affect appetite but may disturb family or eating behaviors that set the scene for eating behaviour disorders of early childhood.

Table 5. Staging Assessment of Severity

Severity	Definition
Mild	Disturbed eating behavior but without clinical suspicion of macro- and micro-nutrient deficiencies
Moderate	Disturbed eating behavior abnormality with confirmed early growth faltering (decreased slope or horizontal growth curves for weight and height) and/or biochemical evidence of micro-nutrient deficiency
Severe	Disturbed eating behavior with confirmed growth faltering (stationary height and decreasing weight) and/or clinical and laboratory evidence of micro-nutrient deficiency

STAGING–SEVERITY ASSESSMENT

As the proposed definition of eating behaviour disorders of early childhood encompasses a heterogeneous group of disorders, a severity score is mandatory to plan a protocol of management and follow up. This will avoid managing all children with eating behaviour disorders of early childhood in the same way.

Important features to assess severity include:

- Parental perception of severity (words such as "always", "severe", "worried" and "concerned" should be noted)
- Family disharmony (with or without overt reference to the 'picky eater' child) must be factored into judging severity of all stages
- Careful plotting of anthropometric measurements (including body mass index and growth velocity) and focus on growth pattern
- Assessment of clinical signs of possible micro-nutrient deficiencies

Attention to the diagnosis of other chronic illnesses that may interfere or cause eating behavior disorders are required.

Growth faltering and micro-nutrient deficiencies are related to severity of eating disorders [13,18] (Table 5).

CLINICAL SUSPICION OF MICRO–NUTRIENT DEFICIENCIES

Iron, zinc and vitamin A are the most common micro-nutrients which could be affected in eating disorders [31,32].

Symptoms of iron deficiency range from fatigue and inability to concentrate to impaired physical and cognitive development of children. The most common reason for iron deficiency is insufficient iron intake from food [32].

The health consequences of zinc deficiency include poor immune system function, growth retardation. Diets with poor meat and fish intake increase the risk of zinc deficiency, because zinc in cereals is poorly bioavailable [31].

Vitamin A is another essential nutrient in the human diet, contributing to the functioning of the retina, the growth of bone and the immune response [33]. Beta-carotene is a precursor of vitamin A found in fruits and vegetables. However, investigations have shown that beta-carotene is not as bioavailable as once thought [34].

MANAGEMENT PLAN

Whilst therapy will have to be individualized, it seems prudent to a select management plan based on the severity of the eating disorder (Table 6) [8]. Whilst vitamin, mineral and nutritional supplements are helpful in treating or preventing macro- and micro-nutrient deficiencies, these should be seen as transient supportive interventions. They may allow time for dietary and behavioral modification. These supplements should not be given during the main meals. Pharmacological therapy has not been shown to be of any efficacy in improving eating behavior and is thus not recommended [35].

Table 7 summarizes the tools and interventions that may be of benefit in children with eating behavior disorders [36].

Dietary management

The role of a dietician or nutritionist is critical in these children [35,37-40]. The dietician will analyse the specificities of the composition of the diet, including quality, quantity, nutritional content and type.

Nutritional management of an eating behavior disorder plays a major role in determining health outcome.

The determinants of a successful nutritional intervention revolve around three main concepts:

1. A systematic method of nutritional assessment (gathering objective data)
2. A thorough evaluation of nutritional intake
3. A solid, structured (nutritional counseling) plan

GATHERING OBJECTIVE DATA

Anthropometric assessment is important in assessing nutritional status of children [40]. Weight and height should be measured using standardized methods and the evaluation of these parameters should be plotted on appropriate curves. In addition, results from objective measurements (serum, bone density, etc.) can be used to further complete the assessment.

EVALUATING NUTRITIONAL INTAKE

Several methods are available to assess dietary intake [35]. At the initial visit a 24-hour recall is noted. This is followed by a 3-day to 1-week food prospective diary (which should include a weekend day) for further assessment.

Food logs or 24-hour food recalls are important for dieticians to collate and must include:

- All food groups
- Well defined meal times
- Food textures at each meal
- Certain behaviors during meal-time such as gaging or spitting out food should also be noted

Table 6. Management Plan for Eating Behaviour Disorder Early Childhood [8]

Severity	Action to take
Mild	Dietary and behavioral education, counseling and consider supplementation
Moderate	As in mild but with immediate dietary manipulation and mandatory supplementation
Severe	As moderate but emergency care and specific laboratory testing is mandatory

Table 7. Tools in the Management of Eating Behaviour Disorder Early Childhood [36]

A. Dietary management (dietician support and advice) including meal time support and advice, multivitamin and mineral supplements and nutritional supplements
B. Behavioral education and therapy (child and family)

NUTRITIONAL COUNSELING AND SUPPLEMENTATION

The important elements to be stressed in nutritional counseling are [41]:

- Developing a meal-time routine
- Planning three main meals and 2-3 snacks, avoiding food fillers
- Encouraging new foods (remembering that it may take up to 15 offerings before a child can be confidently determined to be refusing that food and giving up)
- Considering nutritional supplementation

Behavioral treatment

Early intervention is important. Treatment of highly selective or low overall eating may prevent the development of more serious feeding difficulties. Caregiver-friendly intervention strategies that can be implemented with children in their community environments (e.g., in the child's home or school) may reduce the need for tertiary care [42]. A psychotherapeutic approach that addresses dysfunctional emotions, behaviors, and cognitions through a goal-oriented, systematic process is required. Several researchers have suggested that behavioral mismanagement (i.e., inadvertent reinforcement of inappropriate eating patterns) frequently contributes to the onset and maintenance of feeding problems [43-45]. For example, negative reinforcement may be created if a caregiver typically removes undesired food items or terminates meals when a child refuses to eat or to consume age-appropriate quantities of food, the child may be more likely to display inappropriate behavior during meals to escape or avoid less preferred food items or larger quantities of food.

Behavioral interventions have been demonstrated to be effective for treating feeding problems in children. A multi-component treatment package consisting of positive reinforcement and escape extinction is the most commonly used intervention [44,46-48]. The positive reinforcement component typically involves providing the child with access to preferred stimuli (e.g., food, toys, praise, tokens) for desired eating behavior (i.e., accepting or swallowing bites). Escape extinction which is implemented when a child's feeding problem is presumed to be maintained by negative reinforcement, is a procedure in which escape from, or avoidance of, the demand of eating is no longer permitted. Non-removal of the spoon is an example of an escape extinction procedure that involves positioning the spoon in front of the child's mouth until the bite is accepted, thus preventing escape from or avoidance of the bite presentation [44,46-48]. An alternative escape extinction procedure, physical guidance, consists of exerting gentle pressure on the child's mandibular joint or chin so that the mouth is guided open and the food is placed in the child's mouth [47,48].

Although a common component of interventions for childhood feeding problems, escape extinction has been associated with a number of undesirable side effects, including response bursts (i.e., initial increases in problem behavior), extinction-induced aggression, and emotional responding (e.g., crying) [49]. Moreover, meals may become difficult for caregivers if they must physically prevent escape from or avoidance of eating while managing the side effects of extinction, particularly if increases in desired behaviors (e.g., bite acceptance) do not occur immediately. Thus, escape extinction procedures may not be ideal for treatment programs conducted in natural settings (e.g., in the child's home or school) or by inexperienced care givers (e.g., parents, teachers, paraprofessionals).

Differential (positive) reinforcement of alternative behaviors involves providing the child with access to preferred stimuli contingent on desired behaviors, such as accepting or swallowing bites of food.

An alternative to providing preferred foods or liquids contingently is to provide other types of preferred stimuli continuously throughout the meal. Preferred toys or activities are the most common stimuli used when non-contingent (positive) reinforcement is utilized in the treatment of feeding problems [50,51].

Simultaneous presentation involves presenting a less preferred food at the same time as a more pre-

Table 8. Tips for Nutritional and Behavioral Management by Parents of Children with Eating Behaviour Disorder Early Childhood [54]

· Serving age-appropriate portions
· Getting children acquainted with foods through meal planning and preparation
· Involving children in menu planning
· Making healthy food choices (e.g., fruits, vegetables, and other healthy snacks)
· Sitting with children at meals and snacks
· Eating what their children eat
· Planning family meals, which can encourage healthy eating
· Serving age-appropriate portions
· Avoid the power struggle
· Let kids participate (letting children help in food preparation; let them touch and feel foods)
· Don't label children
· Build on the positives as they occur
· Expose children regularly to new food types
· Don't bribe children to eat
· Beware of over-snacking
· Establish "bottom-line limits"
· Be a positive role model
· Give it time

ferred food. The foods may be presented together on the spoon or blended together, or the non-preferred food may be inside or covered by the preferred food.

Stimulus fading is a technique of gradually changing the ratio or concentration of paired preferred and non-preferred foods or liquids which may reduce the risk associated with pairing non-preferred and preferred foods [52].

High-probability instructional sequence involves presenting a series of instructions for which compliance is highly likely followed by a request for which compliance is unlikely (i.e., a low-probability instruction). The high-probability sequence consists of three presentations of an empty spoon; the low-probability instruction is the presentation of a spoon with food. Results of this study suggest that a high-probability instructional sequence may be effective in increasing compliance (acceptance) with food in the absence of escape extinction if a child demonstrates high levels of compliance with a similar request such as acceptance of an empty spoon [53].

Parents of children with eating behavior disorders should learn the key points of behavioral management of their children as shown in Table 8 [54].

CONCLUSION

The term eating behaviour disorders of early childhood is meant to be the umbrella under which all problems of eating are listed at this specific age. Diagnostic features are proposed and a difference from the DSM5 classification of "Avoidant/Restrictive Food Intake Disorder: 307.59" is shown. Detailed history taking from parents and a thorough clinical examination by the health care worker are essential. A classification of severity is proposed to separate children with meal-time abnormal behavior only from those who have associated risk, or actual consequences, of growth disturbance and micro-nutrient deficiencies. Following staging, therapy, although required to be tailored to children and families, should incorporate dietary and behavioral education and/or therapy. Nutritional supplements are a useful but transient addition to the management of such a condition.

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