Nutritional assessment of preschool children in Zagazig, Sharkia Governorate

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aa	:	amino acids
ADP	:	Air Displacement Plethsymography
APEM	:	Acute Protein-Energy Malnutrition
APPR	:	Acute Phase Protein Response
ATP	:	Adenosine Triphosphate
BCM	:	Body Cell Mass
BIA	:	Bioelectrical Impedance Analysis
BMI	:	Body Mass Index
CHI	:	Creatinine-Height Index
COPD	:	Chronic Obstructive Pulmonary Disease
CPEM	:	Chronic Protein-Energy Malnutrition
CRP	:	C-Reactive Protein
DEXA	:	Dual-Energy X-ray Absorptiometry
ECM	:	Extracellular Mass
EMR	:	Electronic Medical Record
FTT	:	Failure To Thrive
GHD	:	Growth Hormone Deficiency
HGH	:	Human Growth Hormone
IGF-1	:	Insulin-like Growth Factor-1
IL-1	:	Interleukin-1
IL-6	:	Interleukin-6
IUGR	:	Intrauterine Growth Restriction
LOS	:	Length Of Stay
MAC	:	Midarm Circumference
MAMC	:	Mid-Arm Muscle Circumference
NSAIDs	:	Non-Steroidal Anti-Inflammatory Drugs
OI	:	Osteogenesis Imperfecta
PCM	:	Protein-Calorie Malnutrition
PICU	:	Pediatric Intensive Care Unit
RBP	:	Retinol-Binding Protein
REE	:	Resting Energy Expenditure
SDs	:	Standard Deviations
SGA	:	Subjective Global Assessment
TNF	:	Tumor Necrosis Factor
TOBEC	:	Total Body Electrical Conductivity
TSF	:	Triceps Skinfold
UUN	:	Urine Urea Nitrogen

Introduction

Nutritional status is a complex concept that is difficult to define. Adequate nutritional status can perhaps be best defined as maintenance of a normal pattern of growth and a normal body composition by consumption of appropriate amounts and types of food. Malnutrition is even more difficult to define. Although severe malnutrition is easily recognized, the distinction between adequate nutrition and mild-to-moderate malnutrition is not clear. The World Health Organization recommends that a cutoff of 2 Standard Deviations (SDs) below the National Center for Health Statistics sex-specific medians for weight-for-age, height-for-age, and weight-for-height be used to distinguish adequately from inadequately nourished children **(Cameron, 2006)**.

Malnutrition is a rather broad description of various disorders of poor dietary intake and/or enhanced catabolic losses. It has been used to describe the underfeeding conditions of Marasmush and Kwashiorkor seen in underdeveloped countries. It has also been applied to the overfeeding condition of obesity in the developed world and increasingly in the developing world. It has also been used to refer to deficiencies of various vitamins and minerals that accompany states of inadequate nutrient intake surrounding illness **(Afzal et al., 2012)**.

The nutritional assessment is a key determinant in establishing risk for malnutrition and is also valuable in predicting outcomes in the critical care settings as it can increase morbidity and mortality. The purpose of assessing nutritional status is multifold: to identify patients at risk of malnutrition, to recognize preexisting malnutrition,

to obtain baseline data to estimate nutritional needs and to monitor progress throughout the hospital course. So, the nutritional assessment is an integral part of the evaluation of the critically ill child **(Hulst et al., 2006)**.

Anthropometry is a rapid, inexpensive, and noninvasive means to monitor growth, detect growth abnormalities, and assess nutritional status in infants. Anthropometric measurements are plotted on percentile growth curves for comparison against established reference data. Serial measures of growth and nutritional status are helpful in assessing response to nutrition support in hospitalized infants **(Anderson, 2002)**.

Failure To Thrive (FTT) is among the most challenging diagnostic entities facing pediatric hospitalists. The interaction of psychosocial, behavioral, and physiologic factors can be complex. Because there is no uniformly accepted definition of FTT, the incidence cannot be precisely determined. However, in high-risk populations (e.g. low-birth-weight infants and children living in poverty), estimates run as high as 5% to 10%. FTT represents approximately 1% to 5% of patient referrals to tertiary care pediatric centers. Although the disorder is managed primarily in the outpatient setting, more challenging or severely affected patients, or those whose safety is in question, may require hospitalization. Thus, it is critical for pediatric hospitalists to have a clear approach to this diagnostic challenge **(Schwartz, 2000)**.

Olsen et al. (2007) evaluated growth data from 6090 Danish children examined between one to 5 weeks of age, 2 to 6 months of age, and 6 to 11 months of age in an effort to

establish the prevalence of this growth pattern. Utilizing 7 anthropometric criteria of FTT, they examined the concurrence of these criteria in establishing its presence. In this population of infants, 27% met one or more of the anthropometric criteria at either the earlier (3-6 months) or later (6-11 months) examinations. Only 1.3% of infants met the criterion "weight < 80% of median weight for length", and they were a good deal longer than other infants. Twenty two percent of infants crossed 2 major weight percentiles downward, but they were substantially heavier at birth and throughout the study than were other children with FTT.

Dwarfism occurs when an individual person or animal is short in stature resulting from a medical condition caused by abnormal (slow or delayed) growth. In humans, dwarfism is sometimes defined as an adult height of less than 147 cm **(Kennedy, 2008)**.

Aim of the work

Objectives of this study are:

1. To assess nutritional status of preschool children 1-5 years in Zagazig, Sharkia Governorate.
2. To determine factors affecting their nutritional status.

Nutritional status in preschool children

Nutritional status is a complex concept that is difficult to define. Adequate nutritional status can perhaps be best defined as maintenance of a normal pattern of growth and a normal body composition by consumption of appropriate amounts and types of food. Malnutrition is even more difficult to define. Although severe malnutrition is easily recognized, the distinction between adequate nutrition and mild-to-moderate malnutrition is not clear. The World Health Organization recommends that a cutoff of 2 Standard Deviations (SDs) below the National Center for Health Statistics sex-specific medians for weight-for-age, height-for-age, and weight-for-height be used to distinguish adequately from inadequately nourished children **(Cameron, 2006)**.

Nutritional status is particularly important in infants and children, because it influences growth, sexual development, and neurocognitive development. The effect of nutrition is especially marked in infants; growth and developmental deficits acquired during infancy may never fully recover. The period of maximum brain growth in human extends from the third trimester of pregnancy through the first 18 months of postnatal life. Undernutrition in early infancy may lead to long-term deficits in intellectual and motor function. For infants who require assisted ventilation, the harmful effects of malnutrition on lung development, respiratory muscle function and lung mechanics are also of great importance **(Bell, 2003)**.

During identifying risk factors for poor nutritional status, they found different factors per age group. In general, the length of stay appeared to be the factor with the most negative effect on the course of the SD-scores over time **(Hulst et al., 2006)**. **Van Goudoever et al. (2010)** also found an association between prolonged hospitalization and low anthropometric scores. The ICU-stay affected neonates the most, which can be explained by the higher metabolic rate and energy requirement per kg body weight and the higher protein turnover compared to older children. These factors together will lead to a higher rate of catabolism in situations of critical illness and suboptimal nutritional support. Furthermore, neonates and infants are in a period of rapid growth in which it is crucial to consume the optimal amount of calories and protein. Another important factor with a negative influence on recovery was children's previous health status, as seen in the fact that children with history of disease or associated anomalies were having a high prevalence of malnutrition upon admission and during follow-up **(Hulst et al., 2006)**.

Since the nutritional requirements and the nature of fuel utilization in critically ill children have not yet been defined, under-feeding may result in depletion of fat and protein scores and malnutrition. It also decreases the regeneration of respiratory epithelium and causes respiratory muscular weakness, and it may prolong mechanical ventilation by failing to restore respiratory muscle strength and endurance **(Kan et al., 2003)**.

On the other hand, overfeeding can lead to many side effects, including fatty deposition in the liver, diet-induced thermogenesis, increases physiological stress and also prolongs mechanical ventilation. This is due to increased carbon dioxide production, which increases the amount of ventilation necessary to maintain a steady state of arterial blood gases **(Kan et al., 2003)**.

Malnutrition

Definition:

Malnutrition is a rather broad description of various disorders of poor dietary intake and/or enhanced catabolic losses. It has been used to describe the underfeeding conditions of Marasmush and Kwashiorkor seen in underdeveloped countries. It has also been applied to the overfeeding condition of obesity in the developed world and increasingly in the developing world. It has also been used to refer to deficiencies of various vitamins and minerals that accompany states of inadequate nutrient intake surrounding illness **(Afzal et al., 2012)**.

Prevalence of malnutrition:

Malnutrition in children is a major public health problem in many developingc countries in the world. Malnutrition remains one of the oldest and most prevalent global challenges for medicine, the scientific community, and public health organizations. The World Health Organization reported in 1999 that approximately one biollion humans were either undernourished or malnourished. In many developing countires, where food insecurity and socioeconomic limitations are severe, malnutrition is endemic. It has been estimated that worldwide 40,000 deaths per day are attributable to malnutrition. Until the early 1970s, malnutrition was only clearly recognized in the developing world and during cataclysmic events, such as war, in the developed world. However, a number of surveys in the mid-1970s identified a high prevalence of malnutrition among certain populations in the developed world. Even in the era of modern medicine, malnutrition remains prevalent and is often unrecognized. Surveys comparing hospitalized

patients in the 1970s to those in the late 1980s show that despite improved recognition of malnutrition, approximately 50% of surgical and medical patients are still identified as malnourished **(Lal, 2003)**.

In 2000, 26.7% of preschoolers in developing world were estimated to be underweight, as reflected by a low weight-for-age and 32.5% were estimated to be stunted based on a low height-for-age **(Muller and Krawinkel, 2005)**. Prospective studies suggest that severely underweight children (60% of reference weight for age) have more than an 8-fold greater risk of mortality than normally nourished children, that moderately underweight children (60-69% of reference weight for age) have a 4 to 5-fold greater risk, and that even mildly underweight children (70-79% of reference weight for age) have 2- to 3-fold greater risk **(William, 2007)**.

Approximately one fourth of hospitalized children have some degree of Acute (APEM) or Chronic Protein-Energy Malnutrition (CPEM). The prevalence of malnutrition among children admitted to pediatric intensive care unit is still high and it is estimated that over 40% oif patients are malnourished. A literature search was conducted using the electronic databases of CINAHL, Pub Med, and MEDLINE from 1996 to 2005, for English language articles. The prevalence of malnutrition was similar to that found 10 years ago, ranging from 13-78% among acute care patients **(Hulst et al., 2006)**.

Protein malnutrition is more commonly encountered in the hospitalized children. It is related to the underlying illness and is grossly defined as unintentional weight loss of more than 10%. Generally, it occurs as a consequence of a moderate to severe systemic inflammatory response following acute illness or injury. Although dietary deprivation of protein alone could theoretically lead to the classic condition of