ASSESSMENT OF COCHLEAR FUNCTION IN MALNOURISHED INFANTS

Thesis

Submitted for Partial Fulfillment of Master Degree **in Pediatrics**

By

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List of Abbreviations

ABR	Auditory brain stem response.
AOM	Acute otitis media.
ASOM	Acute suppurativ otitis media.
BMI	Body mass index.
CM	Centimeter.
CMV	Cytomegalo virus.
COM	Chronic otitis media.
dB	Decibels.
FAO	Food and Agricultural Organization.
Freq.	Frequency.
HAZ	Height-for-age Z score.
Hb	Hemoglobin.
HC	Head circumference.
HFA	Height-for-age.
HT	Height.
Hz	Hertz.
KHz	Kilo hertz.
KWO	Kwashiorkor.
Mg	Milligram.
mm	Millimeter.
MUAC	Mid-upper arm circumference.
NICU	Neonatal intensive care unit.
NO.	Number.
OAE	Otoacoustic emissions.
PEM	Protein Energy Malnutrition.
SD	Standard deviation.
TEOAE	Transient evoked otoacustic emission.
TSF	Triceps skin fold.

List of Abbreviations

VEP.....	Visual evoked potentials.
Vit.....	Vitamin.
WAZ	Weight-for-age Z score.
WFH	Weight-for-height.
WHO.....	World Health Organization.
WHZ	Weight-for-height Z score.
WT	Weight.

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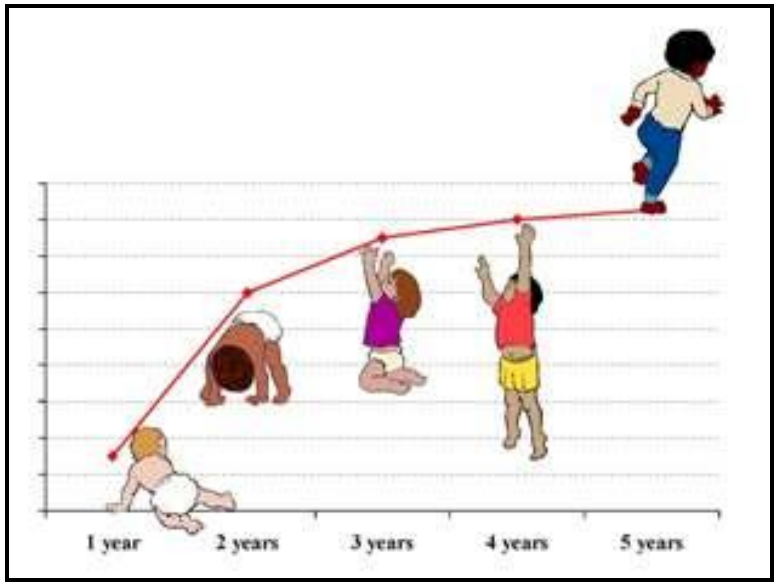
INTRODUCTION

The World Health Organization defines malnutrition as "the cellular imbalance between supply of nutrients and energy and the body's demand for them to ensure growth, maintenance, and specific functions ***(WHO, 2009).***

Malnutrition is globally the most important risk factor for illness and death, contributing to more than half of deaths in children worldwide; child malnutrition was associated with 54% of deaths in children in developing countries in 2001 ***(Blossner et al., 2005).***



Malnutrition affects virtually every organ system. Dietary protein is needed to provide amino acids for synthesis of body proteins and other compounds that have various functional roles. Energy is essential for all biochemical and physiologic

functions in the body. Furthermore, micronutrients are essential in many metabolic functions in the body as components and cofactors in enzymatic processes ***(Benitez et al., 1999).***

About one in three children under five years of age is malnourished as judged by their weight for age. Malnourished children may have learning disabilities, be blind or partially sighted or have hearing loss. Malnutrition can impair brain development in young children, depending on its severity and when it occurs in the child's development ***(Benitez et al., 1999).***

Otoacoustic emissions (OAEs) are weak signals that can be recorded in the ear canal and are considered a byproduct of an active process from the outer hair calls (OHCs) to the basilar membrane ***(Di Girolamo et al., 2007).***

Otoacoustic emissions (OAEs) testing enables the clinician to identify the cochlear component of hearing disorder and to monitor objectively minute changes in cochlear status undetectable by other audiological methods ***(Sichel et al., 2006).***

Auditory brainstem response (ABR) audiometry is a neurologic test of auditory brainstem function in response to auditory (click) stimuli. First described by Jewett and Williston in 1971. ABR audiometry is the most common application of auditory evoked response ***(Neil Bhattacharyya.2009).***

AIM OF THE WORK

Aim of this work is detection of hearing impairment in malnourished infant using OAE & ABR.

Chapter (1)

MALNUTRITION

Definition:

The World Health Organization (WHO) defines malnutrition as ‘‘the cellular imbalance between the supply of nutrients and energy and the body’s demand for them to ensure growth, maintenance, and specific functions ’’ ***(Grover and Ee, 2009).***

Malnutrition is a major health problem, especially in developing countries. It affects almost 800 million people-20% of all in the developing world. It is associated with about half of all child deaths worldwide. Malnourished children have lowered resistance to infection; they are more likely to die from common childhood ailments like diarrheal diseases and respiratory infections; and for those who survive, frequent illness saps their nutritional status, putting them into a vicious cycle of recurring sickness, faltering growth and diminished learning ability ***(Ergin et al., 2007).***

Deficiency of a single nutrient is an example of under nutrition or malnutrition, but deficiency of a single nutrient usually is accompanied by a deficiency of several other nutrients. Protein-energy malnutrition (PEM) is manifested primarily by inadequate dietary intakes of protein and energy,

either because the dietary intakes of these 2 nutrients are less than required for normal growth or because the needs for growth are greater than can be supplied by what otherwise would be adequate intakes. However, PEM is almost always accompanied by deficiencies of other nutrients. For this reason, the terms sever childhood malnutrition (SCU), which more accurately describes the condition is preferred ***(Heird, 2008).***

The long-term effects of nutritional deficiencies in early life depend on the severity and duration of the deficiency, the stage of the children's development, the biological condition of the children and the socio-cultural context ***(Grantham-McGregor et al., 2000).***

Epidemiology:

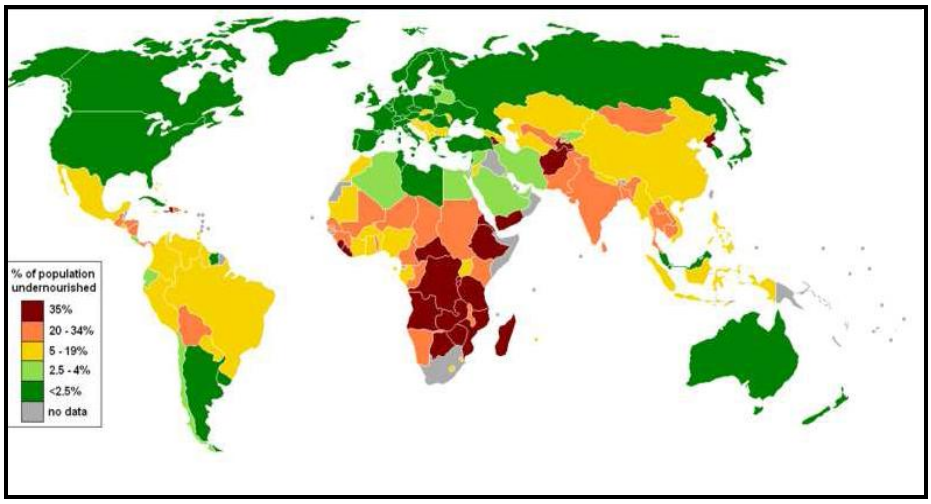
Prevalence:

In 2006 the United Nations Food and Agriculture Organization (FAO) said that 854 million people worldwide are undernourished. This is 12.6 percent of the estimated world population of 6.6 billion. Most of the undernourished (820 million) are in developing countries. The FAO estimate is based on statistical aggregates. It looks at a country's income level and income distribution and uses this information to estimate how many people receive such a low level of income that they are malnourished ***(Allen et al., 2008).***

In July 2008, FAO said that an additional 50 million people became undernourished in 2007 due to higher food prices ***(Allen et al., 2008).***

The world Health Organization estimates that by the year 2015, the prevalence of malnutrition will be increased to 17.6% globally, with 113.4 million children younger than 5 years affected as measured by low weight for age. The overwhelming majority of these children, 112.8 million, will live in developing countries with 70% of these children in Asia, particularly the south central region, and 26% in Africa. An additional 165 million (29.0%) children will have stunted length/height secondary to poor nutrition ***(Grigsby, 2009).***

Currently, more than half of young children in South Asia have PEM, which is 6.5 times the prevalence in the western hemisphere. In Sub-Saharan Africa, 30% of children have PEM. Despite marked improvements globally in the prevalence of malnutrition, rates of under nutrition and stunting have risen from 24% to 26% and 47.3% to 48%, respectively, since 1990, with the worst increases occurring in the eastern region of Africa ***(Grigsby, 2009).***



Fig, (1): This figure shows countries by % of population suffering from under nutrition presented by WFP&FAO.

Age:

- All ages are at risk, but underweight is most prevalent among children under five years of age, especially in the weaning and post-weaning period of 6--24 months. WHO has estimated that approximately 27% (168 million) of children under five years of age are underweight ***(WHO, 2002).***

- Marasmus most commonly occurs in children younger than 5 years. This period is characterized by increased energy requirements and increased susceptibility to viral and bacterial infections. Weaning (the deprivation of breast milk and the commencement of nourishment with other food) occurs during this high-risk period. Weaning is often complicated by geography, economy, hygiene, public health, culture, and