Arabic Version of Pediatric Dizziness Inventory Questionnaire

Thesis Submitted For Fulfilment of the Master Degree in Audiology

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**ABSTRACT:**

**BACKGROUND:** The diagnosis of vertigo syndromes in childhood is considered a difficult challenge. A correct diagnosis, however, makes successful therapy possible, prevents unnecessary investigations and alleviates the worries of parents (Jahn, 2009).

**OBJECTIVE:** To develop an Arabic paediatric dizziness inventory questionnaire for the parents of dizzy children to address the balance complaints of children by the information gathered from it.

**METHODS:** The study group included 20 children suffering from dizziness, aged 6-12 years, who were compared to a control group of 10 healthy children not complaining of dizziness, well matched to the cases with regard to the age and gender. An interview with all parents was done, using our Arabic dizziness questionnaire, which we have carefully designed to include a thorough evaluation of the different systems involved in balance control. Our scoring system was used for balance assessment of their children. Results of referral to different clinics including vestibular were used to measure the relative validity of the questionnaire.

**RESULTS:** The questionnaire was able to categorize the causes of dizziness into categories which matched the diagnosis on referral in 15/20 (75%) of cases. Its sensitivity in diagnosing vestibular category was 88.89%. It also gave a matched specific diagnosis for the cause of dizziness in 11/20 (55%) of cases. The statistically non-significant differences between the cases and the controls with regard the past medical history and family histories were not surprising, due to small number of cases included in each of the different categories and due to the diversity of causes of the vertigo. So the scoring was applied to the present history alone, but relevant data in the past medical history and family history was taken into consideration and added to the diagnosis.

**CONCLUSION:** The questionnaire and its scoring system are comprehensive enough to collect all the information needed to address the balance problem in children and could direct us towards the necessary investigations to confirm the diagnosis. It is a reliable and valid measure. Its overall sensitivity is 75%.

**Keywords:** Arabic, children, dizziness, inventory, questionnaire, vertigo.
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**List of abbreviations**

**AAP:** American Academy of Pediatrics  
**ABR:** Auditory brainstem response  
**BAM:** Basilar artery migraine  
**bid:** twice daily  
**BOR:** Branchio-oto-renal syndrome  
**BPPV:** Benign paroxysmal positional vertigo  
**BPT:** Benign paroxysmal torticollis  
**BPV:** Benign paroxysmal vertigo  
**BPVoC:** Benign paroxysmal vertigo of Childhood  
**CHL:** Conductive hearing loss  
**CMV:** Cytomegalovirus  
**CNS:** Central nervous system  
**CP:** Cerebello-pontine  
**CSF:** Cerebrospinal fluid  
**CT:** Computed tomography  
**CVS:** Cardiovascular  
**DEH:** Delayed endolymphatic hydrops  
**DHI:** Dizziness Handicap Inventory  
**dBnHL:** Decibel normal hearing level  
**E:** Endocrine  
**EA1:** Episodic ataxia type 1  
**EA2:** Episodic ataxia type 2  
**ECM:** Extracellular matrix
EEG: Electroencephalography
ENG: Electro-nystagmography
ENT: Ear, nose, and throat
EOG: Electro-oculography
ER: Extended release
EVA: Enlarged vestibular aqueduct
FHM: Familial Hemiplegic Migraine
G: General
GABA: Gama-amino-butyric acid
GIT: Gastrointestinal tract
GSI: Grason Stadler Immittancemetry
Hz: Hertz
ICHD: International Classification of Headache Disorders
IHS: International Headache Society
IM: Intramuscularly
IV: Intravenously
LC: Left cool
LQT: Long-QT
LW: Left warm
MAD: Migraine-associated dizziness
MD: Menière’s disease
MEE: Middle ear effusion
MRA: Magnetic resonance angiography
MRI: Magnetic resonance imaging
N: Neurologic
OC: Ocular
OM: Otitis Media
OME: Otitis media with effusion
PB: Phonetically balanced
PDS: Pendred syndrome
PLF: Perilymph fistula
PNSA: Pediatric neuropsychological service of Alaska
PO: Per oral
Ps: Psychogenic
PTA: Pure-tone audiometry
RC: Right cool
Resp: Respiratory
RW: Right warm
SD: Standard deviation
SNHL: Sensorineural hearing loss
SRT: Speech reception threshold
SVV: subjective visual vertical
V: Vestibular
VEMP s: Vestibular evoked myogenic potentials
VNG: Videonystgumography
VOR: Vestibulo-ocular reflex
VRT: Vestibular rehabilitation therapy
WDS: Word discrimination score.
$X^2$: Chi Square
Balance disorders in children are relatively common but largely unrecognized. The term is broad, encompassing problems such as clumsiness, delayed motor milestones and motion sickness as well as acute attacks of vertigo, dizziness or syncope. Symptoms are often difficult to describe, particularly so for younger children who lack the vocabulary; thus presentation is often through a third party, the parent, who is largely reliant on observation and his or her own experiences to interpret the child’s difficulty. The child’s first-hand description of the problem is invaluable and should always be carefully sought where possible. Most diagnoses are defied by a detailed history, with examination, testing and investigation providing confirmatory evidence. Revisiting the problem as the child matures can unearth a clearer picture as the child's language and ability to describe the problem, and tolerate testing, mature (Harrop-Griffths, 2009).

Dizziness is a non-specific complaint that can describe many sensations, including light headedness, imbalance, or disequilibrium, unsteadiness, motion intolerance, floating, or a tilting sensation. It can be the manifestation of such psychological disorders as panic attacks or depression, or orthostatic hypotension (Eviatar, 1994; Ravid et al., 2003). Vertigo is considered either an unpleasant disturbance of spatial orientation or the illusory perception of a movement of the body (spinning and wobbling) and/or of the surroundings. Care is necessary when taking the neuro-otological history of the patient (the usual pre-prepared vertigo questionnaire cannot replace it), especially because the patient’s complaint of being “dizzy” is ambiguous (Brandt et al., 2005). Vertigo and dizziness are not unique disease entities. Sometimes vertigo is attributed to vestibular disorders, while dizziness is not (Neuhauser and Lempert, 2004).
There is, however, no general agreement, and visual stimuli can cause vertigo (e.g., height vertigo or optokinetic vection), just as central vestibular or otolith disorders can cause dizziness. The two terms cover a number of multi-sensory and sensori-motor syndromes of various aetiologies and pathogeneses, which can be elucidated only within an interdisciplinary approach (Brandt et al., 2005).

Migraine-associated forms of vertigo are very common in children (benign paroxysmal vertigo of childhood, vestibular migraine) and account for about 50% of diagnoses. Acute unilateral vestibular failure in the course of infectious and para-infectious labyrinthitis is also more common in children than in adults (Jahn, 2009). Balatsouras et al, (2007) stated that viral infections, Benign paroxysmal vertigo of childhood and migraine were the most common causes of vertigo accounting for approximately 65% of their patients. Otitis media, head trauma, benign paroxysmal positional vertigo, meniere's disease and brain tumour were less common causes of vertigo. Jahn, (2009) stated that motion sickness is a frequent and relevant problem in children aged 4-10 years old. A number of rare congenital syndromes can occur with bilateral vestibular failure. Because of the relatively high frequency of brainstem and cerebellar tumors in children, MRI should be considered in all patients presenting with subacute central vestibular signs. Psychosomatic illness can frequently present as dizziness in children; however, this should not preclude a thorough evaluation (Fried, 2009).

The diagnosis of vertigo syndromes in childhood is considered a difficult challenge. A correct diagnosis, however, makes successful therapy possible, prevents unnecessary investigations and alleviates the worries of parents (Jahn, 2009). Accurate history taking and close co-operation between otologist,
paediatrician and neurologist are necessary in the approach to the dizzy child (Blayney and Colman, 1984). A physical examination, particularly an otoneurologic examination, including audiometry, tympanometry, and electronystagmography (ENG), and in selected cases imaging of the head, laboratory tests, and electroencephalography (EEG) help to confirm the diagnosis (Balkany and Finkel 1986; Eviatar 1994; Bower and Cotton 1995; Ravid et al. 2003).

Dizziness and vertigo are common complaints in children, causing an extensive, often unnecessary evaluation task. A pediatric “dizziness questionnaire” was designed and a computer-assisted algorithm was developed to facilitate the diagnostic task (Ravid et al., 2003).

Balance disorders in children may pass unrecognized, and if recognized, numerous unnecessary investigations are done, still without reaching a correct diagnosis in many cases, and treatment is thus symptom directed. This work is based upon knowing that history taking is the cornerstone to reach a correct diagnosis, and to the best of our knowledge, standardized Arabic paediatric dizziness inventory questionnaires are lacking.
Aim of the work

1. To develop an Arabic paediatric dizziness inventory questionnaire for the parents of dizzy children to address the balance complaints of their children by the information gathered from it. This evaluation will help to identify any balance dysfunction and to quantify the impact of dizziness on daily living and to describe the dizziness complaint, and helps to reach diagnoses of the balance dysfunction in children and directs us towards the necessary investigations to confirm this diagnosis.

2. To determine its reliability and relative validity of this inventory.
Chapter 1: Balance Disorders In Children

Balance, as a sense, requires the integration, within the central nervous system, of sensory input from the vestibular hair cells of the inner ear, vision and proprioception, this information, when compared with previous learnt experiences, allow one to sense position and movement in space. Pathology affecting function in any of these three senses (vestibular, vision and proprioception), their central pathways and associated neural connections can lead to balance disturbance. In addition, balance, as a motor function, requires an intact peripheral nervous system and musculoskeletal system, whilst an upright posture is also dependant on the function of the cardiovascular system and the autonomic nervous system as well as the integrity of other homeostatic processes. The range and complexity of difficulties that can give rise to disorders of balance are considerable, and the clinician need a careful and logical approach in order to reach accurate diagnosis and thus to determine optimal management (Harrop-Griffiths, 2009).

Figure (1): Mechanism of balance in children (Luxon et al., 2008)
The vestibular system is anatomically developed and functionally responsive by birth, although vestibular responses can be variable. VOR responses in neonates 24 to 120 hours old are poor, but normalize by 2 months of age and mature further in the first 2 years of life. Optokinetic nystagmus is present in some neonates, but is usually not evident to a rotating drum until 3 to 6 months of age. Smooth pursuit should be normal in healthy children by the age of 5 years. Caloric responses have been successfully obtained in normal children as young as 1 year of age in several studies (Fife et al., 2000).

Dizziness is a lay term used to describe many different sensations, including unsteadiness, imbalance, clumsiness, light-headedness and vertigo. However, vertigo is a medical term referring to an illusion of movement, which may be subjective (personal perception of motion) or objective (observation of motion of the environment), and is characteristically associated with disorders of the vestibular system. Young children are often unable to describe these different perceptions, and thus any complaint of dizziness, instability or vertigo should be considered in the broad context of the “dizzy child” for diagnostic purposes (Luxon et al., 2008).

Episodic vertigo and dizziness are not frequent symptoms in children and have been studied less extensively than in the adult population. However, if vertigo is present various peripheral and central vestibular syndromes may be implicated and exhaustive clinical and laboratory work-up is needed to obtain diagnosis. Vertigo in children differs from that in adults, because of three main reasons. Firstly, vestibular disorders are often ignored in children, because vertiginous manifestations are usually attributed to lack of coordination or behavioural problems. Secondly, as children often lack the communication ability to describe accurately their symptoms, diagnosis is based less in history and much more in clinical examination and laboratory investigations. Finally, although most diseases that cause vertigo in adulthood occur in
childhood as well, their frequency may be different, depending on the age of the patient. A typical example is benign paroxysmal positional vertigo (BPPV), which is the most common peripheral vestibular disorder in adults, but occurs rarely in children. On the other hand, common diseases causing vertigo in children may be unique in this population, such as benign paroxysmal vertigo (BPV) of childhood (Balatsouras et al., 2007).

A problem further complicating the study of vertigo in children is the presence of different results from various reports, depending on whether they originate from paediatric, otolaryngology or neurological departments. Finally, it should be noted that various ophthalmologic abnormalities can appear and become symptomatic in children because of the continuing development of the visual system during the first decade of life. Thus, ocular disorders can be responsible for the manifestation of vertigo, instability or dizziness and a complete ophthalmologic examination should be performed, especially in children with normal neurologic and vestibular examinations (Balatsouras et al., 2007).

Disorders of balance can lead to significant morbidity in children. Delayed locomotor development in infants can adversely affect learning by reducing access to play materials and exploration. The ability to walk with ease opens up an exciting world of opportunity and discovery denied to the child who is still learning to sit. For school-age children delay in locomotor skills and poor postural coordination affect social integration and feeling of self-esteem. Episodic vertigo leads to time off school, with inevitable consequences. For academic attainment and social integration, and in addition can lead to anxiety and panic (Harrop-Griffiths, 2009).
- **Prevalence of dizziness in children:**

  The population-based prevalence of vertigo and dizziness among school children has been reported to be 15%. In the literature, vertigo in children has received much less attention than vertigo occurring in adults. Even among otologists and child neurologists, the key clinicians providing appropriate diagnosis and treatment for vertiginous children, the differential diagnosis is not well established. The clinical picture of vertigo in children deviates from vertigo in adults, since young children do adapt very well to vertigo and dizziness and compensate a vestibular deficit quicker than adults (Niemensivu et al., 2006).

  Pathology in many different systems may give rise to dizziness, ranging from self-limiting inner ear disorders to life-threatening neurological disease. The Prevalence of different conditions depends on the population studied: otolaryngology clinics report a predominance of otological causes, while paediatric neurology clinics report a higher incidence of neurological pathology (Luxon et al., 2008). Nonetheless, certain conditions occur frequently in all studies; specifically, migraine-associated vertigo, otitis-media-related dizziness, benign paroxysmal vertigo, trauma and vestibular neuritis together account for more than half of children with dizziness (Niemensivu et al., 2006).