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Anthropometric Measurements in Children and Their Relationship to Ocular Refraction

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﴿ بِسْمِ اللّهِ الرَّحْمَنِ الرَّحِيمِ ﴾

قَالَ رَبِّ اشْرَحْ لِي صَدْرِي ﴿٢٥﴾ وَيَسِّرْ لِي أَمْرِي ﴿٢٦﴾

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Introduction

Introduction

Health is not merely the absence of disease, but includes many dimensions of well-being including physical, mental, social, environmental, and personal dimensions. Promoting health requires pediatricians to acknowledge the complex forces that impact health, such as familial, socioeconomic, educational, developmental, and biologic entities. With these complexities in mind, pediatricians tailor health supervision visits to individual children to provide optimal care and promote health ***(Green M., 2000).***

The data generated from observation, history, and physical examinations are greatly influenced by a child's developmental stage. A portion of the observational assessment of a child focuses on signs related to specific organ systems that are intimately related to age. A child of 1 month has a more rapid respiratory rate (30 breaths/min) than a 3-yr-old child. Other aspects of observational assessment focus on indicators of the child's overall state of well-being or functional status, such as how the child responds visually to the environment. These visual responses undergo developmental change as does the manner in which stimuli should be presented to elicit a child's optimal visual response ***(Richard E. et al, 2003).***

A 1-month-old infant, for example, is more nearsighted and tends to focus on objects held within 1-2 feet of the face; objects presented in the peripheral fields of vision may be ignored. A young infant's ability to maintain attention on a visual stimulus is less developed than that of an older child. ***(Richard E. et al, 2003).***

Pediatricians must be aware of the developmental dimensions of observed children in order to gather and interpret clinical information accurately. The data generated during the physical examination are also closely linked to a child's stage of development. Height and weight are usually taken as important indicators of well being .These two parameters are influenced by other factors such as environmental, socioeconomic and hereditary conditions ***(silventoinen, 2003).***

Children height and other anthropometric parameters were subjected to many studies as regards their effect on the psychological, cognitive and visual state of children ***(Saw et al., 2002; Ojaimi et al., 2005).***

Hypothesis:

The study hypothesizes that there is a relationship between anthropometric measurements in children and ocular refraction.

Aim of the study:

The aim of this study is to find the relationship between anthropometric measurements in children and ocular refraction.

Design of the study:

Analytical cross sectional study.

REVIEW OF LITERATURE

GROWTH AND DEVELOPMENT

The most dramatic event in growth and development occur before birth. With processes so complex much can grow wrong. The uterus is permeable to adverse social and environmental influences: such as maternal under-nutrition, alcohol, cigarette, drug use and perhaps psychological trauma. The complex interplay between these forces and the somatic and neurological transformations occurring to the fetus influence the infant's behavior at birth and may affect parent-infant interactions throughout infant period ***(Brazelton TB, Cramer BG., 1990).*** (Fig.1)

Somatic Development

Embryonic Period

Milestone of prenatal period is presented in Table-1. By the 6^{th} day of post conceptual age, as implantation begins the embryo consists of a spherical mass of cells with a central cavity (Blastocyst). By 2 weeks, implantation is complete and the uteroplacental circulation has begun; the embryo has 2 distinct layers ectoderm and endoderm, and the amnion has begun to form ***(Richard et al, 2003).***

By 3 weeks, the third primary germ layer has appeared (mesoderm) along with the primitive neural tube and blood vessels, the paired heart tube has begun to pump.

During weeks 4-8, lateral folding of the embryonic plate, followed by growth at the caudal and cranial ends and the budding of arms and legs produce the human like form. Precursors of skeletal muscles and vertebrae appears (somites) together with the branchial arches that will form the maxilla, mandible and face ***(Richard et al, 2003).***

Lens placode appears, marking the site of fetal eyes. The brain grows rapidly, by the end of week-8 the rudimentary of all organs have developed closing the embryonic period. The average embryo weighs average of 9-gm and crown-rump length of 5 cm ***(Richard et al, 2003).***

Fetal period (Fig.1 & table 1)

From week 9 (fetal period), somatic changes consists of increase cell numbers, size and structural remodeling of several organ system, together with changes in body proportion .

By week 10, the face is recognizable human. The mid-gut returns from the umbilical cord into the abdomen.

By week 12, the external genitals become clearly distinguishable. Lung development proceeds with budding of bronchi, bronchioles and successively division. By 20-24 weeks, primitive alveoli has been developed ***(Richard et al, 2003).***

During the third trimester, weight triples and length doubles as body stores of protein, fat, iron and calcium increase. (table-1)

Table-1. Milestones of prenatal development ***(Richard et al, 2003).***

Week	Developmental events
1	Fertilization and implantation beginning of embryonic period.
2	Endo and Ectoderm, Bilaminar embryo.
3	First missed menstrual period (appearance of mesoderm) Trilaminar embryo, somites begin to form.
4	Neural fold fuses, folding of the embryo into human like shape, arms and legs buds appear, crown-rump length 4-5mm.
5	Lens placodes, primitive mouth, digital rays on hands.
6	Primitive nose, philtrum, primary palate, crown-rump length 21-23mm.
7	Eye lids begin to fuse.
8	Ovaries and testis distinguishable.
9	Fetal period begins, crown-rump length 5 cm, weight 9 gm.
10	External genitalia distinguishable.
20	Usual lower limit of viability, weight 460 gm, length 19cm.
25	Third trimester begins, weight 900 gm, length 25 cm.
28	Eye open, fetus turns head down, weight 1,300 gm.
38	Term.

Neurological Development

During the 3rd week, a neural plate appears on the ectodermal surface of the trilaminar embryo. Enfolding produces a neural tube that will become the central nervous system (CNS) and a neural crest that will become the peripheral nervous system(Fig.2).

Neuroectodermal cells differentiate into neurons, astrocytes, oligodendrocytes, and ependymal cells, whereas microglial cells are derived from mesoderm. By the 5th week, the three main subdivisions of forebrain, midbrain, and hindbrain are evident. The dorsal and ventral horns of the spinal cord have begun to form, along with the peripheral motor and sensory nerves. Myelinization begins at midgestation and continues throughout the 1st 2 years of life ***(Richard et al, 2003).***

By the end of the embryonic period (week 8), the gross structure of the nervous system has been established. on a cellular level, the growth of axons and dendrites and the elaboration of synaptic connections continue at a rapid pace, making the CNS vulnerable to teratogenic or hypoxic influences throughout gestation. Rates of increase in DNA (a marker of cell number), overall brain weight, and cholesterol (a marker of myelinization) increases ***(Richard et al, 2003).***

The prenatal and postnatal peaks of DNA probably represent rapid growth .(Fig.3) .

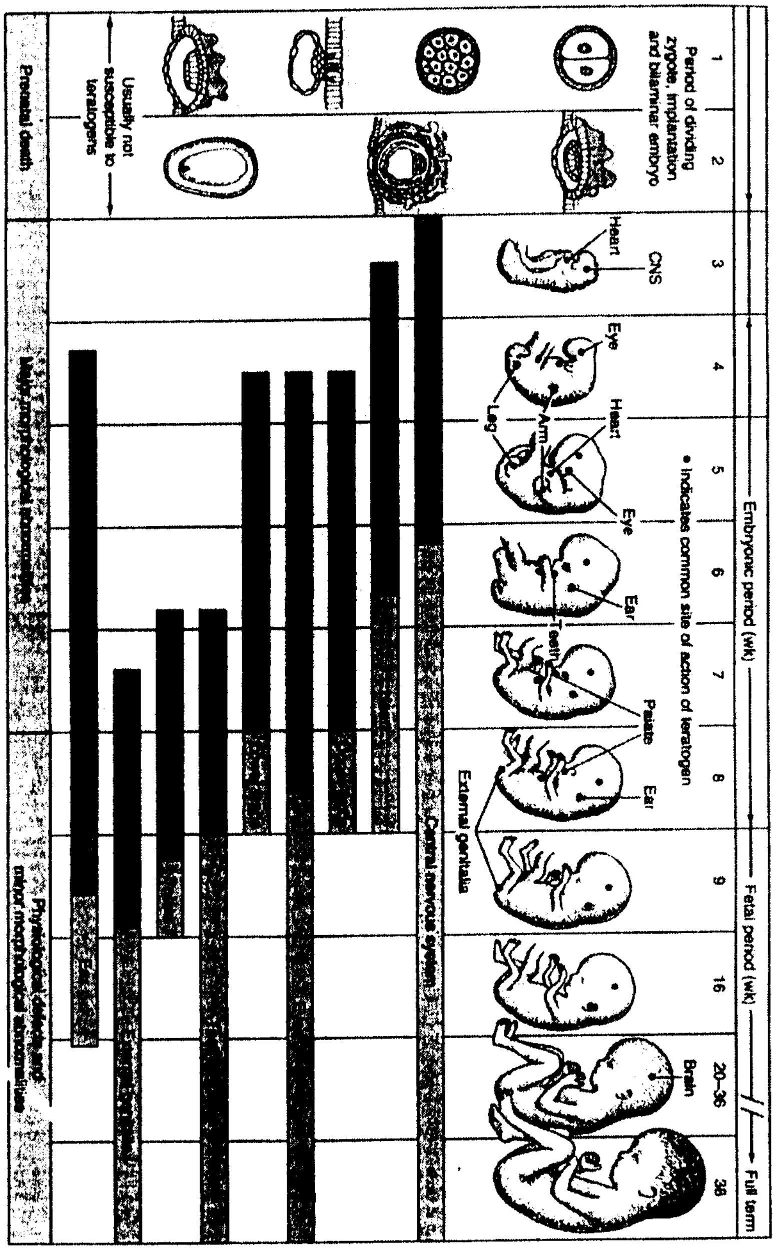


Fig. 1 The Sensitive or Critical Periods in Prenatal Development. Dark Boxes Denote Highly Sensitive Periods, Light Boxes Indicate States That are Less Sensitive to Teratogens. ***(Moore, 1977)***

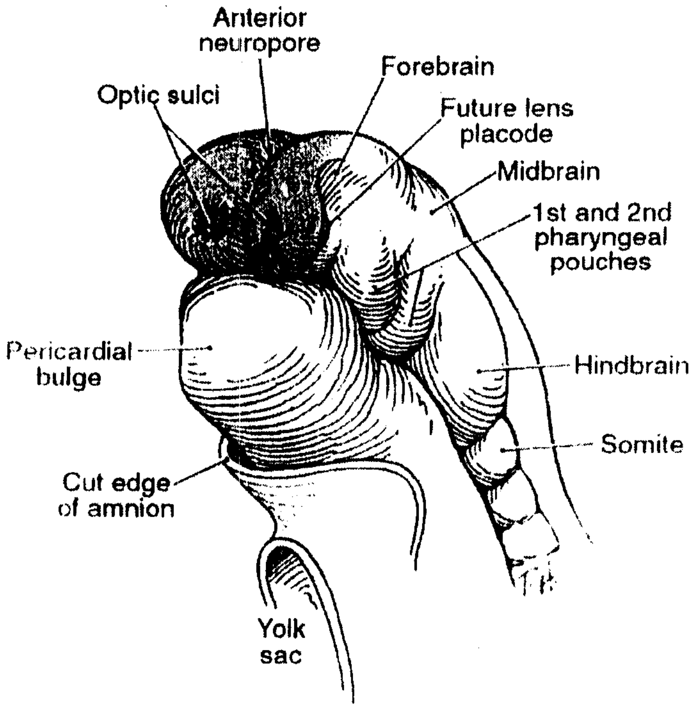


Fig.2 The primitive central and peripheral nervous system

(Webster et al, 1988)

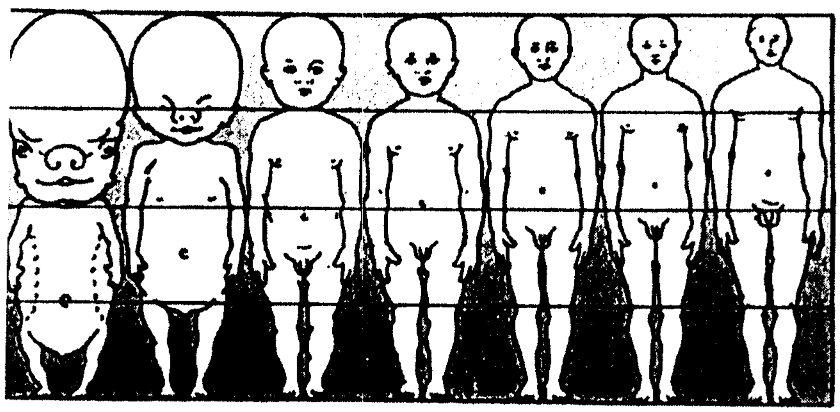


Fig.3 Change of proportions during development

(Robbin, 1928)

Visual Development

The visual pathway continues to develop from birth to approximately the age of 10 years, with most rapid progression occurring in infancy ***(American Academy of ophthalmology, pediatric ophthalmology panel, 2003).***

The infant vision is characterized by low grating resolution and by low contrast sensitivity .With growth, the visual system is developing through certain changes at different levels .(Fig.4)

At the level of the eye , certain anatomical changes take place :

1-Increase in the length of photoreceptors cones present at the outer layer which subsequently increase their sensitivity .

2-Migration of the cones towards the fovea (the central most sensitive retinal layer).

3-Elongation and enlargement of the eye.

The last two items have the effect of changing the scale of eye sensitivity towards a higher levels ***(Yuodelis and Hendrickson, 1986)*** .

At about six weeks of age, the normal baby should be able to make and maintain eye contact with other humans and react with facial expressions.Infants two to three months old should be interested in bright objects. Premature infants can be expected to reach these landmarks later, depending on the degree of prematurity (***Weinacht et al., 1999)*** .

Disconjugate eye movements may be noticed initially, but they should not persist after the age of four months . Skew deviation and sun setting (tonic downward deviation of both eyes) have been observed as transient deviation in the newborn period . Signs of actual poor visual development include wandering eye movements , lack of response to familiar faces and objects, and nystagmus . Staring at bright lights and forceful rubbing of the eyes in an otherwise visually disinterested infant (oculo digital reflex) are other signs of poor visual development and suggest an ocular cause for the deficiency ***(Weinacht et al.,1999).***

At birth the estimated visual acuity is 20/400. During the first year of life, the photoreceptors redistribute and peak foveal cone density increases five folds to achieve the configuration found in the adult retina with improvement in visual acuity .The eye of a normal full-term infant is approximately 55% of adult size. Postnatal growth is maximal during the 1^{st} year, proceeds at a rapid but decelerating rate until the 3^{rd} year, and continues at a slower rate thereafter until puberty, after which little change occurs. ***(Weinacht et al.,1999).***

In general, the anterior structures of the eye are relatively large at birth but thereafter grow proportionately less than the posterior structures. This results in a progressive change in shape of the globe; It becomes more spherical (***Teller et al.,1986).***

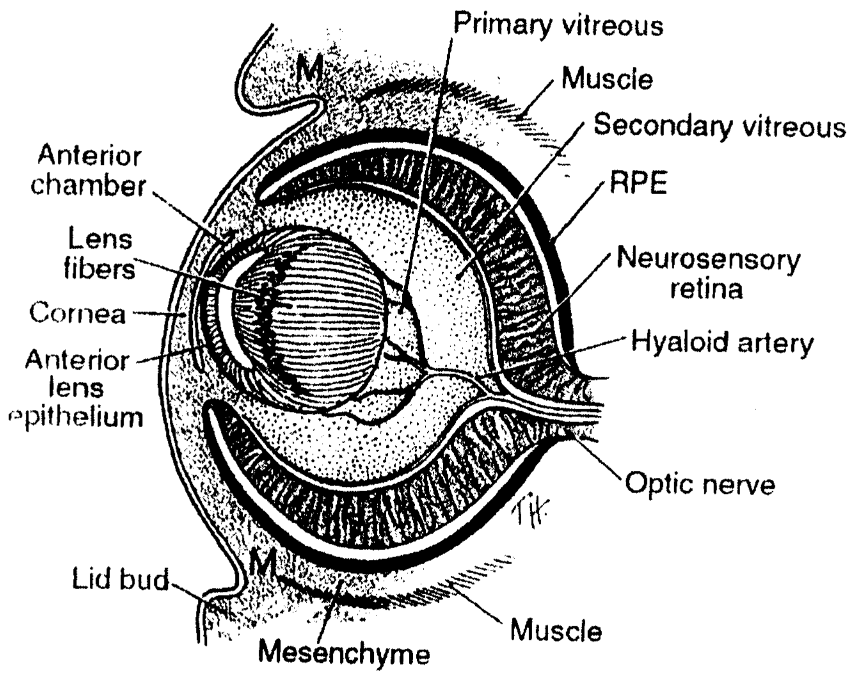


Fig.4 the embryonic eye

(Webster et al, 1988)

DETERMINANTS OF GROWTH AND DEVELOPMENT

Growth and development are not determined solely by genetics nor is a child a product of the environment only. Rather biopsychosocial models recognize the importance of both intrinsic and extrinsic forces. Height, for example is a function of child's genetics endowment(biologic), personal habits of eating (psychological) and access to nutritious food(social) Although biological, psychological, and social factors combined to shape development it is helpful to consider each class of influence separately ***(Shonkoff J. & Phillips D., 2000).***

Biological influences on development include genetics, in utero exposure to teratogens, postpartum illnesses, exposure to hazardous substances, and malnutrition . Adoption and twin studies consistently show that heredity accounts for approximately half of the variance in IQ; and in other personality traits such as sociability and desire for novelty. The specific genes underlying these traits have begun to be identified. The effects on development of prenatal exposure to teratogens; such as mercury and alcohol, and of postpartum insults such as meningitis and traumatic brain Injury, have been extensively studied. Any chronic illness can affect growth and development, either directly or through changes in parenting or peer experiences ***(Shonkoff J. & Phillips D., 2000).***

Genetic factors:

It is well known that human growth is a polygenic process. Numerous genes have been found to be associated with growth disorders , and it is likely that these genes also affect final body height at the population level ***(OMIM, 2001)***. Moreover, the sex chromosomes are assumed to have a crucial role in growth. The effect of the sex chromosome can be observed in the growth retardation in Turner's syndrome ***(Ellison et al., 1997).***The sex difference in mean body height, as well as the higher stature of XYY boys as compared with XY boys, further suggest that the y chromosome may also include genes affecting body height ***(Ogata & Matsus, 1992)***. A sex –related genetic factor for growth and body height has been found in previous studies (Phillips & Matheny ,1990) but inconsistent findings have also been reported ***(Dasguspta & Daschaudhuri, 1997).***

Environmental factors:

In modern Western societies , about 20% of variation in body height is due to environmental variation .In poorer environments, this proportion is probably larger , with lower heritability of body height as well as larger socioeconomic body height differences.

The role of childhood environment is seen in the increase in body height during the 20th century simultaneously with the increase in the standard of living. The most important non-genetic factors affecting growth and body height are nutrition and diseases . Short stature is associated with poorer education and lower social position in adulthood. This is mainly due to family background ***(Silventoinen et al., 2001).***

Living conditions

Body height is a good indicator of childhood living conditions, not only in developing countries but also in modern Western societies ***(Begin et al., 1998).***

Socioeconomic position of the family has been identified as being positively associated with the stature of children ***(Singh & Harrison, 1997).***

The most frequently used indicator is father's social position , but the association is also found for father's and mother's education and family income in developing countries as well in developed countries ***(Cernerud & Elfving, 1995)***.

The social position of the family is likely to be associated with nutrition especially when the average nutritional state of the population is poor ***(Kuh & wadsworth 1989).***

Mother's education may also be associated with maternal care, as educated mothers are more aware of improved methods of care and better treatment of diseases .A finding in two studies in developing countries indicated that mother's low education is a better predictor of stunted growth of a child than father's low education***(Liu et al., 1998).***

External insults

The effect on development of prenatal exposure to teratogens; such as mercury and alcohol, and postpartum insults such as meningitis and traumatic brain injury, have been extensively studied. Any, chronic illness can affect growth and development, either directly or through changes in parenting or peer experiences ***(Brush et al., 1997).***

Effect of diseases

In developed countries the association between diseases and growth is not as strong as in developing countries. The prevalence of serious child diseases is much lower than in developing countries and treatment methods are more advanced. Furthermore, nutritional stress is rare and is not associated with diseases, unlike in developing countries , where the poor economic situation and inadequate nutrition are risk factors for diseases .Thus the synergetic effect of poor nutrition and disease is not pronounced in developed countries . ***(Brush et at., 1997).***

In developing countries, clear evidence exists about the effect of disease on human growth. While the impact of diarrhea on slowed growth has frequently been studied , pneumonia has been found to have similar effects on growth***(Brush et al., 1997).***

Effect of nutrition

Nutrition and disease in childhood are usually regarded as the main factors affecting growth . The effect of under nutrition on body height may already start during fetal life . The role of postnatal nutrition in growth is well documented ; for example , in studies of supplementary programs in developing countries ***(Allen, 1994).***

Among single nutrients affecting growth , protein is probably the most important. Many experimental studies have investigated the effect of protein on growth,[Zerfas, 1986]and[Allen, 1994] the first being conducted as early as 1928 ***(Orr, 1928; Leighton & Clark, 1929)***, when supplementary milk was found to be associated with higher growth velocity among school children in England . In developing countries , protein deficiency is recognized to be one of the main contributors to the stunting of growth in children ***(Martorell & Habicht, 1986)*** .

Minerals and vitamins:

Minerals and vitamins A and D may also influence growth . Numerous intervention studies have established that calcium , phosphorus , magnesium , zinc and iron have an effect on human growth ***(Allen , 1994 ; Prentice & Bates , 1994)***. Vitamin D is essential for the absorption of calcium , and thus its deficiency does have an effect on the mineralization of bones ***(Wasserman & Fullmer , 1995)*** an especially difficult problem in northern regions due to the impact of vitamin A on growth based on supplementary studies is unclear , and some negative results have been found . Vitamin A deficiency is a major health problem in many developing countries***(Hadi et al. , 2000)*** .

Gene –Environment interaction:

Genetic and environmental factors do not act independently of each other , but rather the genotype determines the response to the environment .This phenomenon is called gene-environment interaction . In practice, gene –environment interaction is seen in certain persons being genetically more sensitive to the effect of environment than others ***(Plomin et al., 1997).***

STATISTICS USED IN DESCRIBING GROWTH AND DEVELOPMENT

In everyday use, the term normal is synonymous with healthy. In a statistical sense, normal means that a set of values generates a normal (bell-shaped, or gaussian) distribution. This is the case with anthropometric quantities such as height and weight, and with many developmental milestones such as the age of independent standing ***(Rutter M., 2002).***

For a normally distributed measurement, a histogram with the quantity (e.g., height, or age) on the x -axis and the frequency (the number of children of that height, or the number who stand on their own at that age) on the y-axis generates a bell-shaped curve. In an ideal bell-shaped curve, the peak corresponds to the arithmetic mean of the sample, and to the median and the mode as observations. Distributions are termed skewed if the mean, median, and mode are not the same number. The extent to which observed values cluster near the mean determines the width of the bell and can be described mathematically by the standard deviation (SD). In the ideal normal curve, a range of values extending from 1 SD below the mean to 1 SD above the mean includes approximate value of 68% of the values and each tail above or below that range contains 16 % of the value. A range encompassing +- 2 SD includes 95 % of the values with the upper and lower tails each comprising approximately 2.5 % of the values. And +- 3 SD includes 99.7 % of the values (Table-2) ***(Rutter M., 2002).***

Table-2 Relationship Between SD and Normal Range for Normally Distributed Quantities, observation included in normal range

SD	± 1	1	±2	2	±3	3
%	68.3 %	16%	95.4%	2.3%	99.7%	0.13

For any single measurement, Its distance away from the mean can be expressed In terms of the number of SDs (also called a z score); one can then consult a table of the normal distribution to find out what percentage of measurements fall within that distance from the mean. Software to convert anthropometric data into Z-scores for epidemiologic purposes is readily available. A measurement that falls "outside the normal range"-arbitrarily defined as 2, or sometimes 3 SD on either side of the mean-is atypical, but not necessarily indicative of illness. However, the further a measurement (say, height, weight, or IQ) falls from the mean, the greater the probability that it represents not simply the normal variation, but rather a different, potentially pathologic condition ***(Rutter M., 2002).***

Another way of relating an individual to a group uses percentiles. The percentile is the percentage of individuals in the group who have achieved a certain measured quantity (e.g. a height of 95 cm) or developmental milestone. For anthropometric data, the percentile cutoffs can be calculated from the mean and SD, The 5^{th}, 10^{th}, and 25^{th} percentiles correspond to -1.65 SD, -1.3 SD and -0.7 SD ***(Rutter M., 2002).***

OCULAR REFRACTION

The anatomic components of refraction

The refractive state of the eye is determined by 4 variables: corneal power, lenticular power, the depth of the anterior chamber, and the axial length of the globe(Fig.5).Each of these components has been exhaustively studied in an attempt to correlate a particular component to evolution of refractive error. Review of these data by Curtin (1985) suggested that axial length is the principal determinant of refraction during the infantile growth of the eye(up to 3 yrs of age),adjustment of corneal power and lens power are capable of producing an emmetropic refraction through a large range of axial length ***(Curtin BJ, 1985)***.

During the juvenile growth period (3 to about 14 yrs), it appears that lens and corneal power cannot continue compensating for continued axial expansion resulting in myopic refractive error. Each of the components of refraction changes throughout development. Ocular anterior segment growth during infancy is extremely rapid, the newborn of 10 mm axial length attends nearly adult proportion by the end of the second year.

The lens, unlike the remainder of the eye continues to grow throughout life. At birth, a new born lens is spherical with a thickness of approximately 4mm; it doubles in size during the first year of life. Lens power is doubled from 3-14 years of age owing to progressive flattening. The axial length of the eye undergoes 2 different growth stages, an infantile stage ending at age of 3 years and juvenile stage ending at age 14 years ***(Curtin BJ, 1985)***.

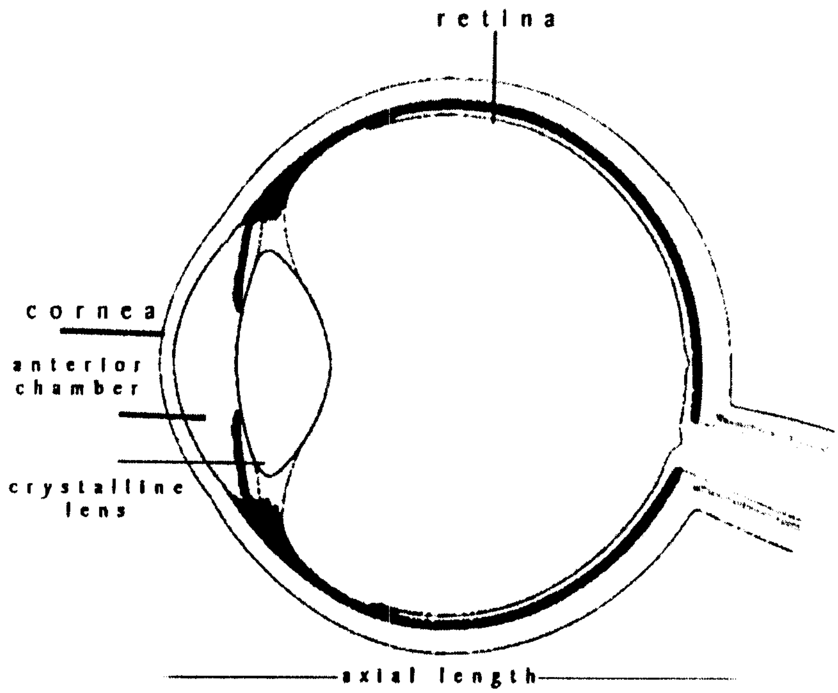


Fig.5 Showing the cornea, lens, anterior chamber and axial length of the globe. (*drawn by the researcher*)

The evolution of refractive errors

The natural history of refractive error has been the subject of numerous, investigation, these are well summarized by Curtin 1985 ***(Curtin BJ, 1985)***.

At birth the eye is approximately 3 diopter hyperopic. During the first years of this century refractive errors were thought to decline from a hyperion high at birth throughout childhood and young adulthood. Cross-sectional previous studies, found that hyperopia increased until 7 years of age and then declined, but recent studies have suggested a steady decline in hyperopic refraction throughout childhood ***(Gordon et al.,1985)*** . Among children wearing spectacles the percentage with correction for hyperopia decreases with age from 66 % at 4-5 years to 11 % at 12-17 years. The prevalence of myopic correction increases from 30 % in the younger group to 87 % in the older group . The prevalence of myopic in the general population approaches nearly 27 % at 20 years of age (**National health survey of USA, 1978**).

Abnormalities of Refraction

Emmetropia is the state in which parallel rays of light come to focus on the retina with the eye at rest (non-accommodating) causing a focused image on the retina , hence a sharp vision .

Such an ideal optical state is common, but the opposite condition, ametropia, often exists.(Fig.6)

Three principal types occur: hyperopia (farsightedness), myopia (nearsightedness), and astigmatism. The majority of children are physiologically hyperopic at birth, but a significant number, especially those born prematurely, are myopic, and they often have some degree of astigmatism. With growth, the refractive state tends to change and should be evaluated periodically. An unequal refractive error in a child can lead to anisometropic amblyopia (lazy eye).It occurs when the unequal refractive error in the two eyes causes the image on one retina to be chronically defocused. This is thought to result from the effect of the image blur on the development of visual acuity in the involved eye and partly from inter-ocular competition.***(American academy of ophthalmology, 2004-2005).***

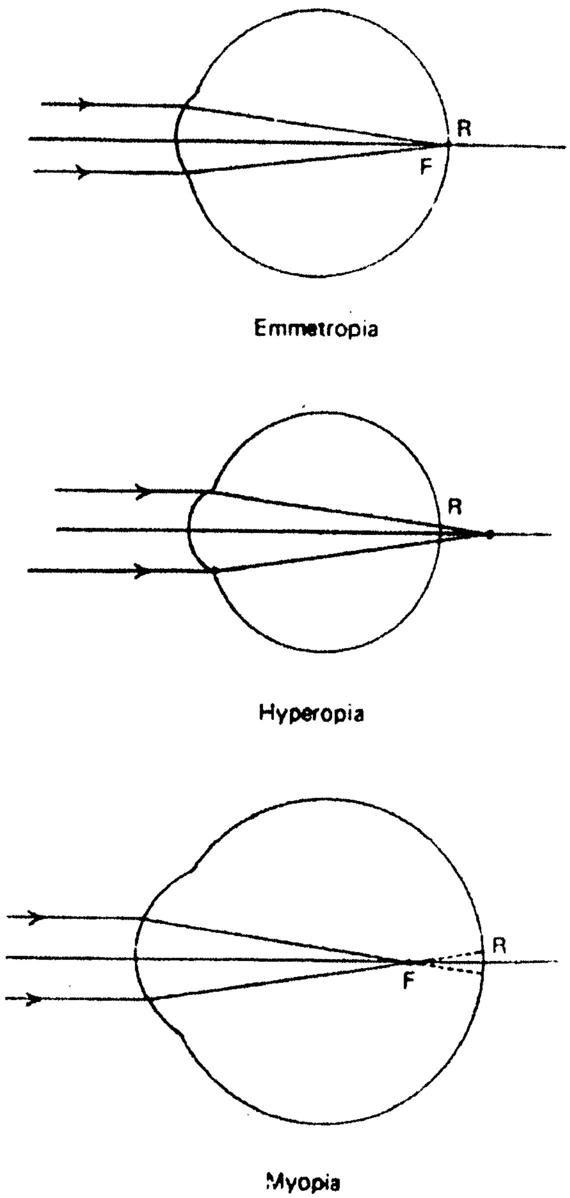


Fig.6 Showing emmetropia, hyperopia and myopia

(Naiem Hoda et al , 2004)

Prevalence of refractive error

The National Health Interview survey of 1979 -1980 in USA found that 52% of the population aged three years and older wore either eye glasses or contact lenses .The 1971-1972 survey in USA estimated a 25% prevalence of myopia for persons aged 12-54 years, and the Framingham Eye Study reported a myopic prevalence of 17.6% for persons aged 52-85 years old .There is an evidence that, over the last one hundred years, the distribution of refractive errors among white school-aged children and college-aged young adults has not changed substantially, apart from a decrease in high or severe myopia across all age groups ***(National Centre for Health Statistics,1980).***

Ethnic differences have been found in the prevalence of refractive errors . Compared to white Americans, Asian Americans have a higher prevalence of myopia, while African Americans have a lower prevalence of myopia .Native Americans have a higher degree of astigmatism but not of myopia ***(Mc Carty et al.,2000)*** .

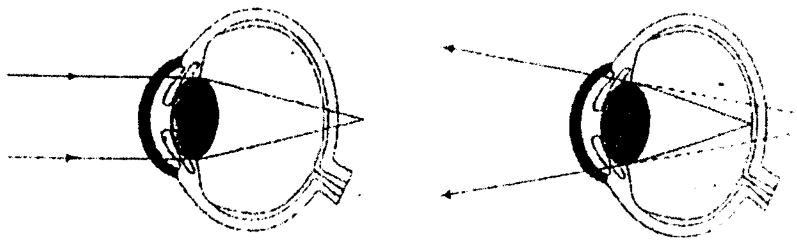
Simple refractive anomalies are hereditarily determined , not progressive beyond the normal development, are associated potentially with moderated vision and require no treatment apart from their optical correction ***(Duke Elder ,1949).***

Hyperopia

If parallel rays of light come to focus posterior to the retina with the eye in a state of rest(non-accommodating), hyperopia or farsightedness exists, This may result because the antero-posterior diameter of the eye is too short, because the refractive power of the cornea or lens is less than normal, or because the lens is dislocated posteriorly. ***(Schoenleber DB, Crouch ER. ,1987)***

In hyperopia, accommodation is used to bring objects into focus for both far and near gaze.(Fig.7) If the accommodative effort required is not too great, the child has clear vision and is comfortable with both distant and close work, In high degrees of hyperopia requiring greater accommodative effort, vision may be blurred, and the child may complain of eye-strain, headaches, or fatigue . Squint, eye rubbing, and lack of interest in reading are frequent manifestations. If the induced discomfort is great enough, a child will not make an effort to see well and may develop bilateral amblyopia. Squint may also be associated . Convex lenses (spectacles or contact lenses) of sufficient strength to provide clear vision and comfort are prescribed when indicated. Even children who have high degrees of hyperopia but who have good vision will happily wear glasses because they provide comfort by eliminating the excessive accommodation required to see well. Preverbal children should also be given glasses for high levels of hyperopia to prevent the development of squint or amblyopia, Children with normal levels of hyperopia do not require correction in the majority of cases.

(Schoenleber DB, Crouch ER. ,1987)



A B

Fig.7 showing focus in hyperopia(A) and adjusted focus by accommodation(B) ***(American Academy of Ophthalmology, 2005)***

Myopia

In myopia, parallel rays of light come to focus anterior to the retina. This may result because the antero-posterior diameter of the eye is too long, because the refractive power of the cornea or lens is greater than normal, or because the lens is dislocated forward ***(Curtin BJ.1985)***.

The principal symptom is blurred vision for distant objects, The far point of clear vision varies inversely with the degree of myopia; as the myopia increases, the far point of clear vision comes closer. Thus, myopic children tend to hold objects and reading matter close, prefer to be close to the blackboard, and may be uninterested in distant activities, Frowning and squinting are common, because the visual acuity is improved. when the lid aperture is reduced; the effect is similar to that achieved by closing or 'stopping down' the aperture of the diaphragm of a camera ***(Gordon RA, Donzis BP. 1986).***

Myopia is infrequent In infants and preschool children. It is more common in accommodation during near work has been considered by some to lead to preterm infants and in infants with a history of retinopathy of prematurity. A hereditary tendency to myopia is also observed, and children of myopic parents should be examined at an early age, The incidence of myopia increases during the school years, especially during the preteen and teen years, The degree of myopia also increases with age, during the growing years ***(Gordon RA, Donzis BP. 1986).***

Concave lenses (spectacles or contact lenses) of appropriate strength to provide clear vision and comfort are prescribed, Changes are usually needed periodically, sometimes in 1-2 years, sometimes every few months. Excessive progression of myopia. Based on this philosophy, some practitioners advocate the use of cycloplegic agents, bifocals, intentional under-correction of myopic refractive errors, or mandatory removal of myopic glasses for near work in an effort to retard the progression of myopia. The value of such treatment has not been scientifically proved ***(Spencer JB.& Metes MB.,1990).***

In most cases, myopia is not a result of pathologic alteration of the eye and is referred to as simple or physiologic myopia. Some children may have pathologic myopia, a rare condition caused by a pathologically abnormal axial length of the eye; this is usually associated with thinning of the sclera, choroids , and retina and often with some degree of uncorrectable visual impairment.

Tears or breaks in the retina may occur as it becomes increasingly thin , leading to the development of retinal detachments. Myopia may also occur as a result of other ocular abnormalities, such as; keratoconus , ectopia lentis, congenital stationary night blindness, and glaucoma and is also a major feature of the Stickler syndrome ***(Curtin BJ,1985).***

Astigmatism

In astigmatism, the refractive power of the various meridians of the eye differs. Most cases are caused by irregularity in the curvature of the cornea; same astigmatism results from changes in the lens. Mild degrees of astigmatism are common and may produce no symptoms. With greater degrees, there may be distortion of vision, To achieve a clearer Image, a person with astigmatism uses accommodation or frowns or squints to obtain a pinhole effect. Symptoms include eye strain, headache, and fatigue, eye rubbing, Indifference to school work, and holding reading matter close, are common manifestations in children with astigmatism .Cylindrical or sphero-cylindrical lenses are used to provide optical correction when Indicated . Glasses may be needed constantly or only part time, depending on the degree of astigmatism and the severity of the attendant symptoms. In some cases, contact lenses are-used***(Spencer JB.& Metes MB.,1990).***

EMMETROPIZATION

It appears that the human eye develops so as to reduce refractive errors through a still undetermined mechanisms termed emmetropization .As an example ; a longitudinal survey of 382 children aged 3-16 years found that 72% had an increase in axial length of more than 1.1 mm, while only 23% had a corresponding change in refraction. Apparently, compensatory reductions in corneal and lenticular power preventing the development of corresponding refractive errors in the majority of subjects ***(Saunders,1995).***

Most newborn are born hyperopic or emmetropic. Babies with mild hyperopia often become emmetropic or even myopic when they become older; more extreme hyperopes remain hyperopic or become more hyperopic . Most studies in children report a low prevalence of myopia .As an example, one study of children aged six to eight years found that only 3% were myopes; further, the prevalence of hyperopia was lower, as compared with infant studies The process of emmetropization reduces the 50% prevalence of astigmatism of 0.75-1.0 diopter or more in infancy to less than 20% beyond the first two years of life ***(Saunders,1995).***

Visual Acuity tests for children

There are many tests of visual acuity. The choice of test used depends on a child's age and ability to cooperate, as well as a clinician's preference and experience with each test .

The earliest age that objective visual acuity testing with input from the child can be accomplished is approximately 2 1/2 years . Distance visual acuity is most useful and ideally should be measured at 6 meters (20 feet) .Instruments and charts can be calibrated for distances down to 3 meters (10 feet) . Most pediatric ophthalmologists prefer a standard projected chart using the symbols of a horse, duck, car, telephone and birthday cake . (Fig.8) The projector allows the examiner to isolate the individual line, which is useful in keeping the child's attention Snellen's letters and numbers,(Fig.9) Landolt's rings,(Fig.10) and illiterate E's(Fig.11) can be displayed ***(Teller et al., 1986).***

An adult-type Snellen's acuity chart can be used at about 5 or 6 years of age if the child knows letters. An acuity of 20/40 (6/12) is generally accepted as normal for 3-yr-aid children, At 4 year of age, 20/30 (6/9) is typical, by 5 or 6 years of age, most children attain 20/20 (6/6) vision ***(Teller et al., 1986).***

Whatever chart is used, care must be taken to totally occlude the non tested eye . Children frequently peek around the hand-held cover and must be monitored carefully.

Fig.8 pediatric visual acuity chart

(Leonard, 1998)

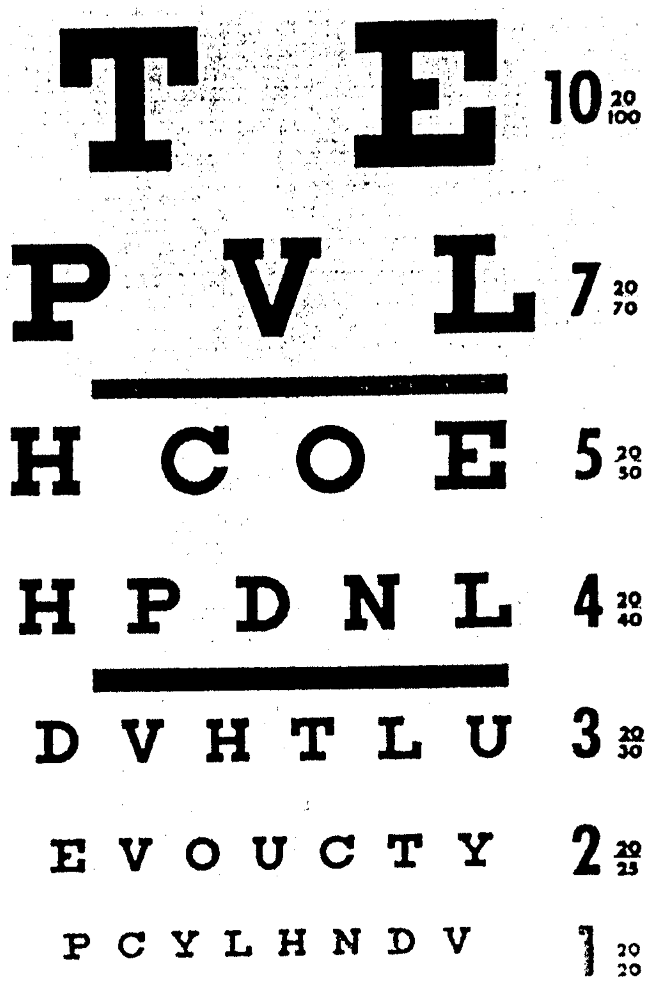


Fig.9 Snellen's visual acuity chart

(Fred et al, 1996)

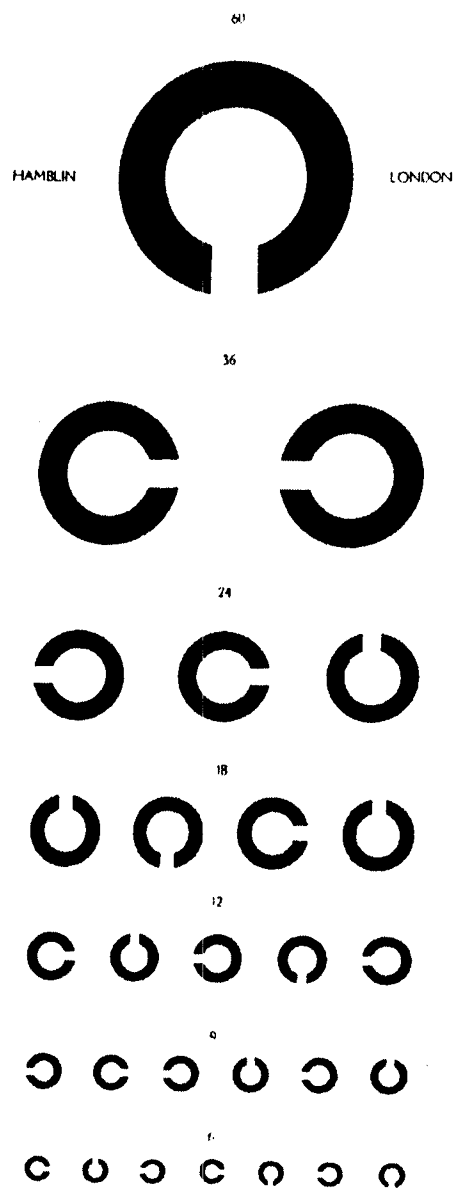


Fig.10 Landolt's ring visual acuity chart

(Fred et al, 1996)

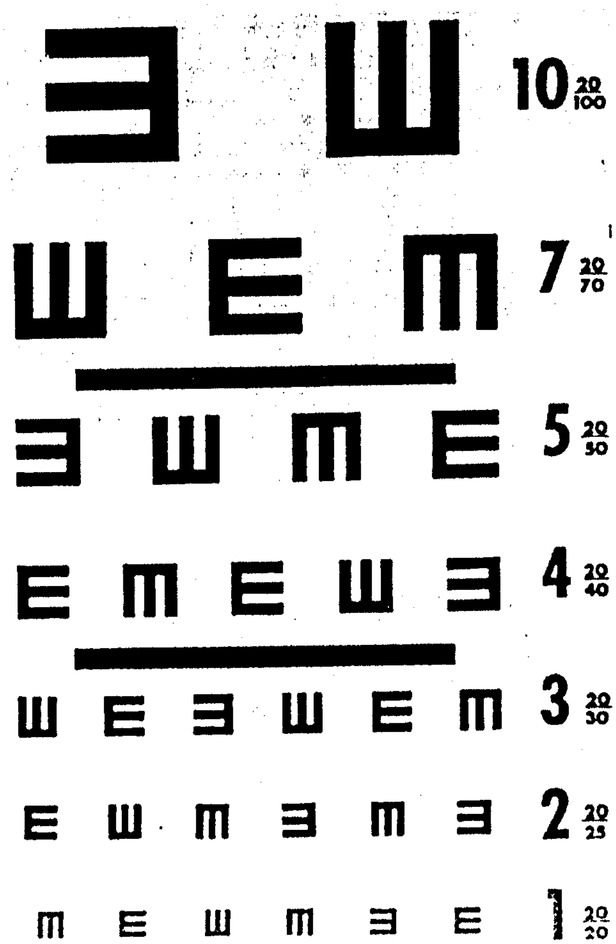


Fig.11 Illiterate E visual acuity chart

(Leonard, 1998)

Measurements of refraction

Measurement of the refractive state of the eye (refraction) can be accomplished objectively and subjectively, The objective method involves focusing a beam of light from a retinoscope onto a patient's retina through lenses of various powers placed in front of the eye, This method is precise and can be carried out at any age because it requires no response from a patient, In infants and children, refraction is best done after instillation of eye drops that produce mydriasis (dilatation of the pupil) and cycloplegica (relaxation of accommodation); those used most commonly are tropicamide (Mydriacyl),cyclopentolate (Cyclogyl), homatropine hydrobromide and atropine sulfate ***(Spencer JB.& Metes MB.,1990).***

The subjective method involves placing various lenses in front of the eye and having the patient report which lenses provide the clearest image of the letters on the chart: This method depends on patient's ability to discriminate and communicate, but it can be used for some children and can be helpful in determining the best refractive correction for children who are developmentally capable ***(Fulton et al., 1980)***.

Anthropometric status has long been known to be associated with many health problems e.g. the association of obesity and increased risk of diabetes mellitus. The association of anthropometric status and eye conditions has started to be investigated in many countries and positive correlations were found with some eye problems; higher intraocular pressure and cataract were found to be more common in taller individuals ***(Caulfield et al., 1999).*** Cataract occurs either in underweight or overweight individuals, whereas elevated intraocular pressure is associated with obesity ***(Mori et al, 2000).***

Prior association of height with refractive status has been primarily investigated in adult population; myopic males were 1.9cm taller than non-myopic males in a population-based Finnish study***(Teikari, 1987).*** Among Danish draftees, myopes were 0.8cm taller than emmetropes, and hypermetropes were 0.2cm shorter(***Teasdale and Goldschidt, 1988).***

In a population–based survey of a Labrador community, axial length of the eyeball correlated positively with adult stature. ***(Johnson et al., 1979)***. However, a study of 106926 Israeli military recruits found that myopia was not associated with height ***(Rosner et al., 1995).***

In a more recent study in Singapore Chinese adults, taller persons were found to have eyes with longer axial length ,deeper anterior chambers, thinner lenses, and flatter corneas although no increase in myopia. Ocular measurements did not vary with weight or BMI ***(Wong et al., 2001)***.

Because the period of critical body and eye growth occurs in early childhood, the effect of dynamic changes in body growth on eye measurements would be best studied in young growing children. Fewer studies have been conducted on children.

In an early study of British children of unspecified age attending a school clinic, children with progressive myopia grew in both height and weight more quickly than children with stationary myopia ***(Gardiner, 1955)***.

In a cross-sectional study of 1449 Chinese school children, aged 7 to 9 years, it was found that taller children had eyes with longer axial lengths, deeper vitreous chambers, flatter corneas, and refractions that tended towards myopia,also heavier weight children or who had a higher BMI tended to have refractions that were more hyperopic, and eyes in heavier children had shorter vitreous chambers ***(Seang et al., 2002)***.

PATIENTS AND METHODS

1-Patients

One hundred child were included in this study.

Age range 5-12 years. Cases were recruited from the Ophthalmologic Clinic at Ain-Shams University Hospitals.

Ethical consent:

An informed consent was obtained from parents after the nature of the study is explained.

Inclusion criteria:

1-Age: 5-12 years.

2-Sex: Males and females.

Exclusion criteria :

1-Age: Children below 5 years old and above 12 years old.

2-Medical status: Children with serious medical condition, chronic illness, preterm infants, cases previously admitted to neonatal ICU, any congenital disorder affecting the anthropometrical measurements will be subsequently excluded such as short stature syndrome, Turner syndrome, hydrocephalus and microcephaly.

3-Any apparent eye infection, patients with asymmetrical orbits, lid masses, exophthalmos and cases with any serious eye disorders such as cataract and glaucoma are excluded from the study.

2-Methods

Each child included in this study was subjected to:

A. Full History taking

Including obstetric history, prior medical problems and history of milestones of development.

B. Anthropometric measurements

Which include:-

1-Height was measured with shoes off using a standardized wooden height rod and recorded in cm.

2-Weight was measured in Kg using an ordinary scale (Fig. 12)

3-Skull circumference will be measured in cm on bony prominences (occipital, frontal and parietal).

4-Body Mass Index was calculated as follows:

BMI = weight in Kg/ Height2 in meters

C. Ophthalmological examination:

1-Detection of visual acuity for both eyes by using visual acuity chart.

2-Cycloplegic refraction for both eyes using autorefractometer (Topcon RM 8800) .(Fig.13)

Fig.13 Autorefractometer

Fig.12 Measuring weight

RESULTS

I-Patient Demography

Patients ranged in age from 5 to 12 years with a mean age of 8.90 years (S.D=2.54). 52 of 100 patients (52%) were females and 48 (48%) were males. Patients were arranged in 3 groups according to their error of refraction into emmetropes with no error of refraction. Myopes with short sight and hypermetropes with long sight.

Table (3) Age distribution among the study group

Range	Mean	±S.D
5-12 yrs	8.90	±2.54

Table (4) Gender distribution among the study group

Female		Male		Total
No	%	No	%	
52	52	48	48	100

Table (5) Number of patients in each group

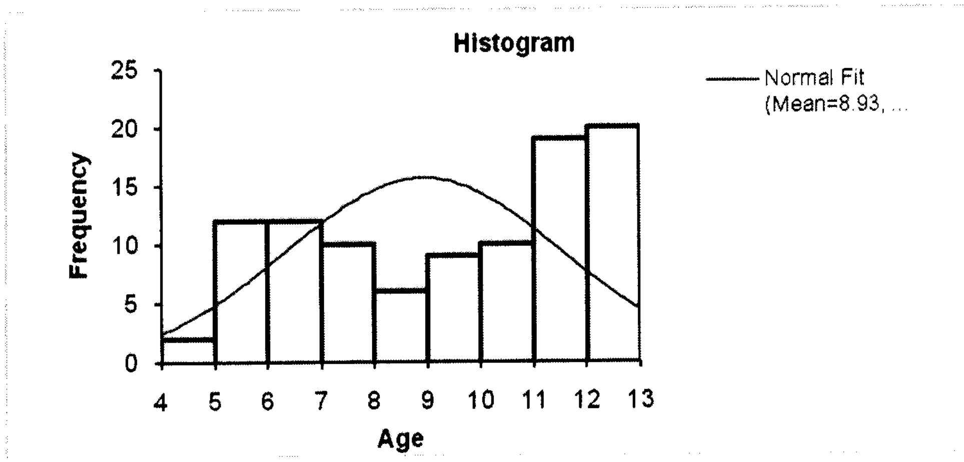
Type of error of refraction	No. of patients	%
Emmetropes	32	32 %
Myopes	34	34 %
Hypermetrope	34	34 %
Total	100/100	100 %

Table (6) Age distribution among 3 groups

Group	Mean (yrs	±S.D	Min (yrs)	Max (yrs)
Emmetrope	9.50	±2.71	5.0	12.0
Myopes	8.84	±2.27	5.0	12.0
Hypermetrope	8.47	±2.31	5.0	11.0

Age distribution among 3 groups was with a maximum of 12 years and minimum of 5 years. Mean of 9.50 years SD ±2.71 in emmetropic group and 8.84 years SD ±2.27 for myopic group and in hypermtropic was 8.47 years SD ±2.31. (Graph-1)

Graph-1 Age distribution among 3-groups



II-Patient Descriptions

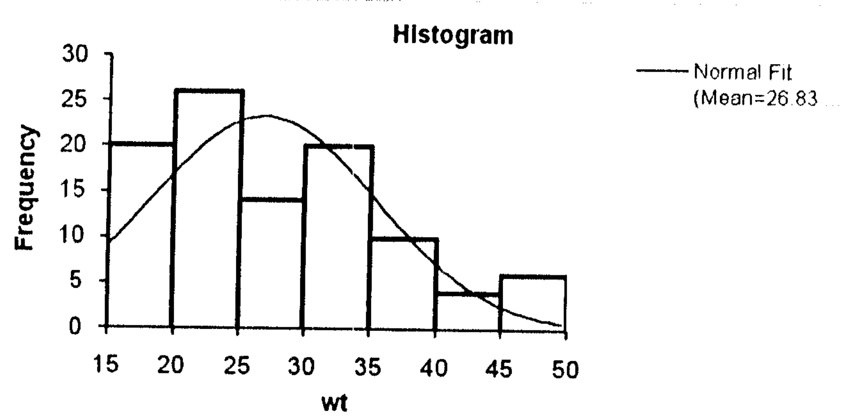
1-Body Weight:

Table (7) Distribution of Weight (Kg) among each group

Group	Mean (Kg)	±S.D	Min (Kg)	Max (Kg)
Emmetrope	28.2	±7.7	16.0	46.0
Myopes	27.26	±9.1	16.0	45.0
Hypermetrope	25.60	±8.9	15.0	49.0

Body weight measured and tabulated as shown in table (7) minimum body weight was 15.0 Kg and maximum body weight was 49.0 Kg, statistical analysis shown in table (7) no statistical differences between the 3 groups regarding body weight. (graph-2).

(Graph-2) Body weight distribution graph among 3 groups



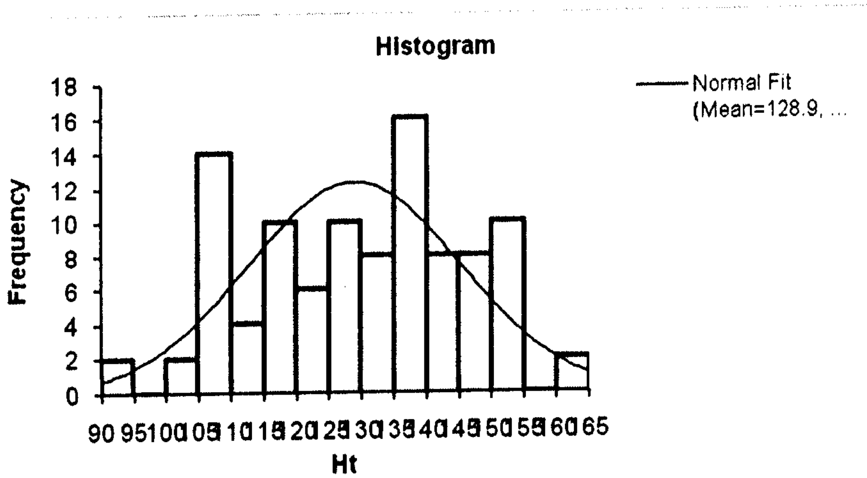
2-Body Height:

Table (8) Distribution of Height (cm) among each group

Group	Mean (cm)	±S.D	Min (cm)	Max (cm)
Emmetrope	129.61	±15.3	107.0	160.0
Myopes	132.0	±18.1	104.0	154.0
Hypermetrope	125.0	±14.8	92.0	150.0

Each group body height measured and tabulated as shown in table (8) minimum body height was 92.0 cm and maximum body height was 160.0 cm, statistical analysis shown in table (8) no statistical differences between the 3 groups regarding height. (graph 3)

(Graph-3) Body height distribution among 3 groups



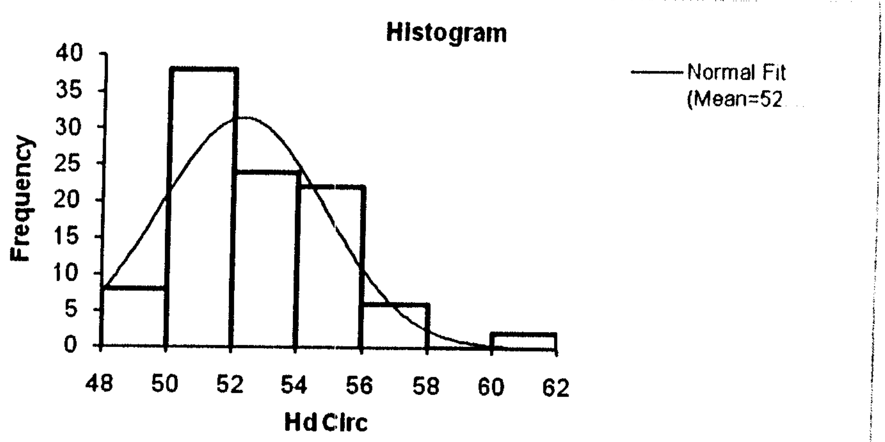
3- Skull Circumference:

Table (9) Distribution of skull circumference (cm) among each group

Group	Mean (cm)	±S.D	Min (cm)	Max (cm)
Emmetrope	52.3	±2.3	48.0	57.0
Myopes	52.9	±3.0	48.0	60.0
Hypermetrope	51.60	±2. 1	48.0	57.0

Each group body skull circumference measured and tabulated as shown in table (9) minimum skull circumference was 48.0 cm and maximum skull circumference was 60.0 cm, statistical analysis shown in table (9) no statistical differences between the 3 groups regarding skull circumference (graph 4).

(Graph-4) Skull circumference distribution among 3 groups



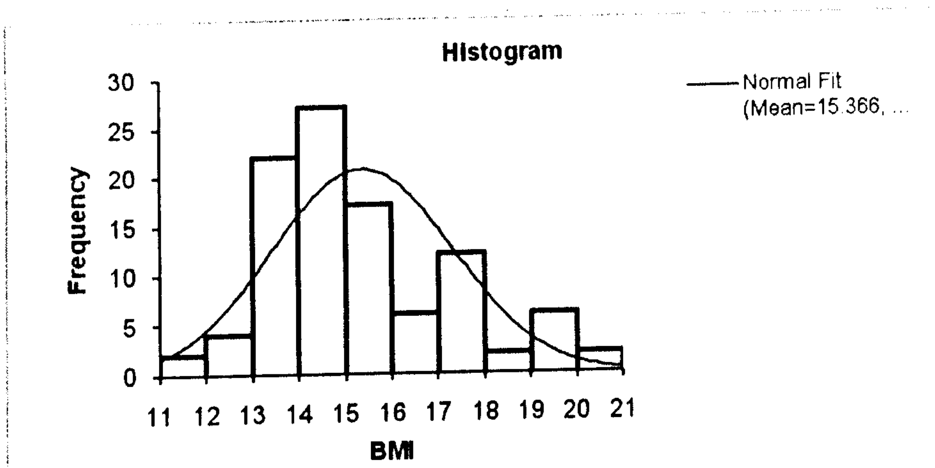
4- Body Mass Index (BMI):

Table (10) Distribution of BMI among each group

Group	Mean	±S.D	Min	Max
Emmetrope	15.42	±1.97	11.42	19.01
Myope	15.44	±1.86	12.60	19.39
Hypermetrope	15.24	±1.96	12.60	20.12

Each group body BMI measured and tabulated as shown in table (10) minimum BMI was 11.42 and maximum BMI was 20.12, statistical analysis shown in table (10) no statistical differences between the 3 groups regarding BMI (graph 5).

(Graph-5) Body Mass Index distribution among 3 groups



III-Correlations between anthropometric measurements and Ocular refraction in all groups

Table (11) Chi-Square X^2 correlation between ocular refraction and anthropometric measurements

Anthropometric measures	Value	2-tailed=r
Weight	-0.045	>0.05
Height	-0.082	>0.05
Skull circumference	-0.174	>0.05
BMI	0.080	>0.05

In this tables Chi-square correlation shows no association between spherical equivalent and any anthropometric measurement as p value >0.05 for 2 tailed test non-statistically significant.

IV-Correlations between anthropometric measures and 3-Groups

1-Emmtropes:

Table (12) Chi-Square X^2 correlation between emmetropes and different anthropometric measurements

Anthropometric measures	**Value**	**2-tailed=r**
Weight	0.429	>0.05
Height	0.921	>0.05
Skull circumference	0.011	>0.05
BMI	0.317	>0.05

In this tables Chi-square correlation shows no association between emmetopes and any anthropometric measurement as p value >0.05 for 2 tailed test non-statistically significant.

2-Myopes:

Anthropometric measures	**Value**	**2-tailed=r**
Weight	0.079	>0.05
Height	-0.014	>0.05
Skull circumference	-0.118	>0.05
BMI	0.105	>0.05

Table (13) Chi-Square X^2 correlation between myopes and different anthropometric measurements

In this tables Chi-square correlation shows no association between myopes and any anthropometric measurement as p value >0.05 for 2 tailed test non-statistically significant.

2-Hypermetropes:

Anthropometric measures	Value	2-tailed=r
Weight	-0.732	>0.05
Height	-0.825	>0.05
Skull circumference	0.38	>0.05
BMI	**0.924**	**<0.05**

Table (14) Chi-Square X^2 correlation between hypermetropes and different anthropometric measurements

In this tables Chi-square correlation shows no association between hypermetropes and all anthropometric measurement as p value >0.05 for 2 tailed test non-statistically significant.

V-Correlations between different anthropometric measurements as regarding age

Anthropometric measures	Value	r
Weight	0.714	P<0.05
Height	0.825	P<0.05
Skull circumference	0.637	P<0.05
BMI	0.991	**P<0.05**

Table (15) Chi-Square X^2 correlation between Age and different anthropometric measurements in 3 groups

In this tables there is an association between Age and all anthropometric measurement as p value <0.05 for 2 tailed test statistically significant.

DISCUSSION

To our knowledge, no previous such studies were recorded in Egypt or the Arab world. In our present study we investigated the state of refraction in relation to the anthropometric measurements such as height, weight, BMI and skull circumference in 100 Egyptian preschool and school children.

In our results, as expected; there were a positive linear correlation between anthropometric measurements and age.

After adjustment for age and gender, none of the anthropometric measurements accounted for an association with ocular refraction. Ocular dimensions such as eyeball axial length, depth of the anterior and posterior chambers were not included in this study.

Our results are considered in consistence with those of **Wong et al., 2001** who found no change in the refractive state in spite of a positive correlation of height with eyeball axial length, depth of the anterior and posterior chambers and did not find any correlation of weight or BMI with refraction. This could be explained by the effect of emmetropization process that compensates for the increased axial length if present by a compensatory decrease in corneal and lenticular power.

Our findings revealed an apparent decrease in the mean height (128.87 cm) and weight (27.02 Kg) compared to the results of "National Project of Standard Growth Curves for Egyptian Children and Adolescents" where mean height was (130.34 cm) and weight was (31.65 Kg) ***(Isis Ghali et al. 2002)***.

This result may be attributed to a difference in the socioeconomic status of the children in the two studies. Their study was intended to be conducted on children of high to middle socioeconomic class as known by the level of schools chosen for the survey, where our study was done on lower socioeconomic class.

It has long been observed that the most obvious difference in length or height is between populations living in developing countries and developed countries; within a country, exits between well-off and poor subpopulations (**Ulijaszek, 1994**). Liu, Jalil and Karlberg conducted a community-based study of four areas in Lahore, Pakistan, which represented various levels of socioeconomic status and different degrees of urbanization .

The upper middle class group had a high socioeconomic status close to that of populations in most developed countries and served as a local control group. In their series, infants living in the three areas studied i.e. the peri-urban slum, village and urban slum, seemed to be exposed to a hostile environment pertaining to length growth .They concluded that non-specified indicators, such as family income, parents educational level, housing standards, family structure and possessions, are usually inversely related to stunting in early life. **(liu Jalil, Karl berg, 1998).**

One hundred case is considered a small number for such study, however, we hope that it will be a good step for further bigger studies in the future . Regarding the work published by **Seang-Mei Saw et al, 2002,** who presented 1449 Chinese schoolchildren, aged 7 to 9 years, from three Singapore schools, we worked on nearly the same age group, as this is considered the most important age for children growth. Both studies had the same specific exclusion criteria.

The prevalence rate of myopes in our study was (34 %), hyperopic were 34% and the rest was emmetropes (32%), which is similar to **Seang-Mei Saw et al, 2002,** the prevalence rate of myopes were (34%) in their study.

Body weight measured a minimum of 15.0 Kg and maximum of 49.0 Kg. No statistical differences were found between the 3 groups regarding body weight, and thus no correlation to error of refraction .

As regards body height; the minimum was 92.0 cm and the maximum height was 160.0 cm with no statistical differences between the 3 groups thus no correlation to errors of refraction.

In our study the mean BMI was, 15.42 kg/m^2 ±1.97 for emmetropes, 15.44 kg/m^2 ±1.86 for myopes and 15.24 kg/m^2 ±1.96 for hyeropes which is slightly higher for myopes and slightly less for hyperopic but with no statistical differences between the 3 groups.

In **Seang-Mei Saw et al, 2002,** study the mean BMI was 16.3 ± 2.4 kg/m^2 in children with higher degrees of myopia, 16.0 ± 2.6 kg/m^2 in children with lower degrees of myopia, 16.2 ± 2.5 kg/m^2 in children with emmetropia, and 16.2 ± 2.5 kg/m^2 for hyperopic children. Controlling for the same factors , their study showed that the BMIs of higher myopes, lower myopes, and hyperopic did not differ from those of emmetropes ($P = 0.48$, 0.10, and 0.22, respectively).

As for skull circumferences, the mean for emmetropes was 52.3 cm, ±2.3 while 52.9 cm ± 3.0 for myopes and 51.60 cm ±2.1 for hyperopes. Minimum skull circumference was 48.0 cm and maximum was 60.0 cm. No statistical differences between the 3 groups regarding skull circumferences, $p > 0.05$.

In the myopic group, there was a correlation between different anthropometric measurements with each other, as p value <0.001 statistically significant. However no correlation between myopic refractive error and any anthropometric measurements as p value > 0.001.

In the hyperopes, also no association between hyperopic refractive errors and any anthropometric measurement as p value > 0.001 statistically non-significant,but correlating weight and height to other measurements in such group found an association in the hyperopic group between weight height and BMI and other anthropometric measurement as p value <0.001 statistically significant but not for skull circumferences.

Ojaimi et al, 2005 showed no significant association between refraction and any of the measured anthropometric parameters . But showed that height was strongly related to axial length and corneal radius, which we haven't measured in our study because they are specialized ophthalmlogical examinations beyond the scope of our study.

Several investigators examined the relationship between refractive error and height. **Chow et al., 1990 and Saw et al., 2002;** height has been associated with more myopic refractions, but the pattern was not consistent, however other studies have found no relationship **Rosner, et al 1995 and Attebo , et al., 1999).**

Saw et al., 2004, presented an interesting article identifying the relation between birth size and the results of refractive error and biometry measurements in children.

They found that children with birth weights > 4.0 kg had longer axial lengths of the eye ball (adjusted mean 23.65 mm versus 23.16 mm), compared with children with birth weights < 2.5 kg, after controlling for age, sex, height, parental myopia, and gestational age. For every 1 cm increment in head circumference at birth, the axial length of the eye ball was longer by 0.05 mm. For every 1 cm increment in birth length, the axial length was longer by 0.02 mm in multivariate analysis.

Additional week increases in gestational age till 46 weeks resulted in eye ball axial lengths that were longer by 0.04 mm, controlling for age, sex, school, parental myopia, and height..

They concluded that children who were born heavier, had larger head sizes or lengths at birth, or who were born more mature had longer eye ball axial lengths, and deeper vitreous chambers; but there were no differences in refraction at ages 7–9 years, possibly because of the observed compensatory flattening of the cornea.

Babies born less mature did not have increased risks of myopia, contrary to the findings of increased risks of myopia in premature babies from previous studies such as that of **Shapiro A, 1980.**

They concluded that across the normal range of birth weights, babies with greater overall body and eye growth were more likely to have longer axial lengths and deeper vitreous chambers in childhood, but refractions remained the same as there was compensatory flattening of the cornea.

Ha S et al, 2007, presented a study investigate relationships between age, weight, refractive error, and morphologic changes in children's eyes by computerized tomography (CT). 772 eyes of 386 patients under the age of 20 years underwent CT of the orbit, 406 eyes of 354 patients with clear CT images and normal eyeball contour were enrolled in the study. The axial lengths, widths, horizontal and vertical lengths, refractive errors, and body weight of eyes were measured, and relationship between these parameters were investigated. The axial length was longer in case of myopia compared to emmetropia in all age groups and there was almost no difference in the increase rate of axial length by the age of myopia and emmetropia. However, emmetropia showed increasing rate of width/axial length with However, the width was wider in case of myopia compared to emmetropia in all age groups and the increase rate of width in myopia by age was smaller than that of emmetropia. Myopia showed decreasing rate of width/axial length with increase of age, from 1.004 in 5 years to 0.971 in 20 years. increase of age, from 0.990 in 5 years to 1.006 in 20 years.

Based on UNICEF reports as well as results from Summer Camps Projects and WHO defined "Vision 2020"program priorities studies were designed to determine visual impairments and other major health problems all over the world. **(McMahon P, 2000)**.

While not a population-based study, our study was designed to be thorough in its assessment so as to provide as better as possible to the participating children and to provide health providers a sense of the magnitude and importance of full anthropometric and eye examination for children in their early age groups.

Conclusion and Recommendations

This study was intended to focus on the importance of the anthropometric measurements and the importance of eye examination for children in their early age group.

In our study no relationship was found between the anthropometric measurements and the state of ocular refraction.

Our findings revealed an apparent decrease in the mean height and weight of lower socioeconomic class children compared with those with a higher socioeconomic class.

The present work though not on a wide scale, is hoped to be a step for further larger studies on the same subject and other related topics, aiming at a better health to Egyptian children.

Summary

Height and weight are usually considered important parameters of children well being. Variable anthropometric parameters were subjected to many studies as regards their effect on the psychological, cognitive, and visual state of children. **(Saw et al; 2002, Ojami et al; 2005)**

Aim of the work:

The aim of this work was to find if there is a relationship between anthropometric measurements and the state of ocular refraction in preschool and primary education Egyptian children.

Patients and methods:

100 children were subjected to the study with age range 5-12 years old. They were collected from the out-patient clinic of ophthalmology of Ain Shams University Hospital.

Height, weight, BMI, skull circumference and cycloplegic refraction were recorded for each child.

Cases were divided according to the refraction state into 3groups:

1-Emmetropes (no error of refraction).

2-Hypermetropes (long sight)

3-Myopes (short sight).

Cases with astigmatism were converted into the spherical equivalent into either myopes or hypermetropes.

This study discussed growth in children as regards somatic, neurological and visual development. Determinants of growth were reviewed which are genetic factors, environmental factors including living conditions, state of nutrition, external insults and effect of diseases. (***Silventoinen et al; 2001,Richard et al; 2003***).

As regards ocular refraction; which is known by the position of focus of the incident parallel rays entering the eye from the object of regard, it is either:

1- Emmetropia; were the focus is on the retina without any effort and hence the visual acuity is sharp.

2- Hypermetropia; were the focus is behind the retina, but with the effort of accommodation can be brought on the retina.

3- Myopia; were the focus is in front of the retina and the distant vision is blurred.

4- Astigmatism; were there are more than one focus.

Ocular refraction is affected by four variables; corneal power, lens power, axial length of the eye-ball and depth of the anterior chamber. ***(American academy of ophthalmology; 2004-2005)***.

Results and discussion

Our results showed that the anthropometric measurements were proportional to age and statistically correlated as $p < 0.05$ in all the studied groups. However, they were generally less than those recorded in the survey done in 2002 for the standard growth curves for Egyptian children and adolescents (**Isis Ghaly et al. 2002**), probably due to different socioeconomic levels in the two studies.

No statistically significant association was found between any of the anthropometric measurements and ocular refraction in all the studied groups as $p > 0.05$. This is in agreement with most of the reviewed researches though many of them found a positive correlation with the axial length of the eye- ball which can be explained by the ability of the eye to do emmetropization.

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Arabic Summary

الملخص العربى

الصحة الجيدة ليست فقط الخلو من الأمراض، ولكن لها معايير أخرى بدنية وعقلية وبيئية.

دائما ما يكون قياس الطول والوزن من المعايير الهامة لتقييم الحالة الصحية للأطفال، ولقد خضعت تلك القياسات الجسدية لدراسات كثيرة لمعرفة تأثيرها وارتباطها بالوظائف النفسية، المعرفية والبصرية للأطفال.

الهدف من البحث:

معرفة أن كان يوجد ارتباط بين القياسات الجسدية وحالة الانكسار البصري للأطفال المصريين في مرحلة ما قبل المدرسة ومرحلة التعليم الابتدائي.

الحالات و طرق البحث:

شملت الدراسة ١٠٠ طفلا في المرحلة العمرية من ٥-١٢ سنة من الأطفال المترددين على العيادة الخارجية لطب العيون لمستشفيات جامعة عين شمس.

تم قياس الطول و الوزن و محيط الرأس وكذلك قوة الإبصار وقياس حالة الانكسار البصري لهؤلاء الاطفال.

تم تقسيم الحالات إلى ثلاث مجموعات هي: الانكسار البصري السليم، حالات طول النظر و حالات قصر النظر.

بالنسبة إلى حالات الاستجماتيزم تم حساب المعادل الكروى لتحويلها الى حالات طول او قصر النظر.

ناقشت هذه الدراسة مراحل نمو الأطفال من الناحية البدنية، العصبية والبصرية، كذلك العوامل التي تؤثر فى النمو مثل تاثير الجينات الوراثية او الظروف البيئية مثل مستوى المعيشة، التغذية، التعرض للملوثات و الأمراض.

يعّرف الانكسار البصري بمكان تجمع الأشعة داخل العين عند النظر للأشياء ويقسم إلى:

١- انكسار بصري سليم حيث تتجمع الاشعة فى بؤرة واحدة على شبكية العين وتصبح الرؤية واضحة تماما بدون مجهود.

٢- طول النظر: حيث تتجمع الأشعة فى بؤرة واحدة خلف الشبكية ولكن بمجهود من العضلة الموجودة حول عدسة العين يمكن ضبط البؤرة على الشبكية.

٣- قصر النظر: حيث تكون البؤرة أمام الشبكية وتصبح الرؤية غير واضحة للمسافات البعيدة.

٤- الاستجماتيزم: حيث توجد أكثر من بؤرة تؤثر على وضوح الرؤية.

هناك أربعة عوامل تؤثر على حالة الانكسار البصري وهي:

- طول مقله العين
- قوة القرانية
- قوة العدسة البللورية
- عمق الخزانة الأمامية داخل العين.

النتائج والمناقشة:

أظهرت النتائج تناسب الوزن الطول و محيط الرأس مع عمر الاطفال و ذلك فى كل مجموعات البحث. لكن كانت تلك القياسات الجسدية لهؤلاء الاطفال اقل بصفة عامة عند مقارانتها بالقياسات المماثلة فى الدراسة الموسعة التي أجريت عام ٢٠٠٢ تحت مسمى "**منحنيات النمو القياسية للأطفال والمراهقين المصريين**".

يمكن تفسير تلك النتيجة باختلاف المستوى المعيشي للأطفال محل البحث في الدراستين. لم تظهر النتائج وجود ارتباط بين القياسات الجسدية للاطفال محل الدراسة و حالة الانكسار البصري لديهم وهو ما يتفق مع معظم الأبحاث التي أثبتت وجود ترابط بين القياسات الجسدية كالطول والوزن وقياس طول مقلة العين ولكن لم تثبت وجود علاقة بين تلك القياسات الجسدية و حالة الانكسار البصري.

يمكن تفسير ذلك بقدره العين على تعديل قياساتها اثناء مراحل النمو مثل تعديل تحدب القرنية و العدسة البللورية لتعادل طول او قصر مقلة العين وبالتالي لا يصبح مؤثرا في حالة الانكسار البصري.

نأمل أن تكون هذه الدراسة بداية لمزيد من الابحاث الموسعة في هذا المجال وتساعد على معرفة أهمية القياسات الجسدية للأطفال و علاقتها بالوظائف المختلفة للجسم بهدف الوصول لصحة أفضل للأطفال المصريين.

مستخلص

شملت الدراسة ١٠٠ طفلا فى المرحلة العمرية من ١٢,٥ سنة من الأطفال المترددين على العيادة الخارجية لطب العيون لمستشفيات جامعة عين شمس .

تم قياس الطول والوزن ومحيط الرأس وكذلك قوة الإبصار وقياس حالة الانكسار البصرى لهؤلاء الاطفال .

تم تقسيم الحالات إلى ثلاث مجموعات هى: الانكسار البصرى السليم ، حالات طول النظر وحالة قصر النظر .

بالنسبة إلى حالات الاستجماتيزم تم حساب معدل الكروى لتحويلها إلى حالات طول أو قصر النظر .

ناقشت هذه الدراسة مراحل نمو الأطفال من الناحية البدنية ، العصبية والبصرية ، كذلك العوامل التى تؤثر فى النمو مثل تأثير الجينات الوراثية أو الظروف البيئية مثل مستوى المعيشة ، التغذية ، التعرض للملوثات والامراض .

الكلمات الكاشفة

- القياسات الجسدية
- الانكسار البصرى
- علاقة عيوب الإبصار بالقياسات الجسدية

جامعة عين شمس
معهد الدراسات العليا للطفولة

شكر

اشكر السادة الأساتذة الذين قاموا بالإشراف وهم:

١- أ٠د / جمال سامى على — أستاذ طب الأطفال ونائب رئيس الجامعة لشئون المجتمع والبيئة ٠

٢- د / وليد محمد الظواهرى — مدرس طب وجراحة العيون – كلية طب – جامعة عين شمس ٠

ثم الأشخاص الذين تعانوا معى البحث

وهم :

١- أ٠د / هدى محمد صابر نعيم
٢- د / احمد محمد المعتصم
٣-

وكذلك الهيئات الآتية :

١-

٢-

٣-

صفحة العنوان

اسم الطالبة: ايمان علاء الدين اسماعيل عبد المطلب

الدرجة العلمية: ماجستير

القسم التابع له: الدراسات الطبية

أسم المعهد: معهد الدراسات العليا للطفولة

الجامعة: عين شمس

سنة التخرج: ٢٠٠٩

سنة المنح: ٢٠٠٩

معهد الدراسات العليا للطفولة

رسالة: ماجستير

اسم الطالبة: إيمان علاء الدين إسماعيل عبد المطلب

عنوان الرسالة: (القياسات الجسدية للأطفال وعلاقتها بالانكسار البصرى)

أسم الدرجة : الماجستير

لجنة الأشراف :

١- أ.د / جمال سامى على — أستاذ طب الأطفال ونائب رئيس الجامعة لشئون المجتمع والبيئة.

٢- د / وليد محمد الظواهرى — مدرس طب وجراحة العيون – كلية طب – جامعة عين شمس.

تاريخ البحث : ١٩/ ٥ / ٢٠٠٧

الدراسات العليا

ختم الإجازة : أجيزت الرسالة بتاريخ :

٨ / ٢/ ٢٠٠٩

موافقة مجلس المعهد [illegible] — موافقة مجلس الجامعة

٢٧ / ٧/ ٢٠١١ — ٢٠٠ / /

معهد الدراسات العليا للطفولة
قسم الدراسات الطبيه

القياسات الجسدية للأطفال وعلاقتها بالانكسار البصري

رسالة مقدمة توطئة للحصول على
درجة الماجستير فى دراسات الطفولة
قسم الدراسات الطبيه

مقدمة من

الطبيبة/ إيمان علاء الدين إسماعيل عبد المطلب
بكالوريوس الطب و الجراحة كلية الطب-جامعة عين شمس

تحت إشراف

أ.د/ جمال سامى على
أستاذ طب الأطفال
نائب رئيس الجامعة لشئون المجتمع وتنمية البيئة
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٢٠٠٩