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Growth Parameters Changes (Weight and Height) in DCM with Acute and Chronic LV Dysfunction

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Abstract
Background: The growth failure is one of the most significant problem in children with dilated cardiomyopathy, one third of those with DCM have growth failure**.** Echocardiography regarded as the corner stone in the diagnosis of dilated cardiomyopathy. **Material and methods:** This study included 48 child with dilated cardiomyopathy with LV dysfunction, that diagnosed clinically by history, clinical examination, electrocardiography and echocardiography, including 2D-echocardiography, M-mode and Doppler study. Those patient were subdivided to 15 child present with acute heart failure (Acute DCM) (8 female and 7 male), and 33 child who are known cases of dilated cardiomyopathy reported in the cardiology out clinic with chronic LV dysfunction (18 female and 15 male) ,both groups followed for one year with regular clinical, laboratory and echocardiographic evaluation during treatment coarse for LV dysfunction. another 48 control healthy child with same age groups involved in the study (25 female and 23male), the age of both patient and control groups ranging from 1month- 12 years.**Results:** All patient had LV dysfunction at the time of attendance . In this study, most patient that had DCM with acute LV dysfunction had normal weight and height at the time of attendance, but after one year , those with LV dysfunction in spite of treatment had defective weight and height, but those with chronic LV dysfunction, that develop normal cardiac function after one year of treatment will improve their weight and height after one year treatment and follow up.**Conclusions:** Most children with chronic dilated cardiomyopathy have delayed growth regarding weight and height with decrease hemoglobin level .The improvement in the cardiac function of some patients usually followed by increment in their body weight and height over the periods of follow up.

Introduction

The normal growth in children is an indicator of well being, growth may be defective in many illnesses in children (Blecker U, et al 2000), there is defective metabolic process , growth failure is usually multifactorial ,it is either due to increase energy expenditure due to chronic disease process or malabsorption ,or decrease dietary intake or psychological problem, two or more of these factors are responsible of growth retardation in any chronic illness .The growth failure is one of the most significant problem in children with dilated cardiomyopathy ,one third of those with DCM have growth failure(Azevedo VM ,et al 2004).

Materials and methods

The participants belongs to both patients and control groups were selected and examined in the cardiology clinic of Karbala pediatric teaching hospital between April 2013 and October 2014, the type of test discussed for the parents, starting with history taking especially family history, and presence of familial cardiac disease, some questionnaire about the age and degree of relatives of both parents, past medical history and antenatal history. Then measuring the weight and the height of the affected child, physical examination that involving measuring the temperature by mercury thermometer, heart rate with auscultation of the chest and palpation and auscultation of the precordium for presence of added sounds, also detection of partial oxygen pressure SPO2, by using digital pulse oxymeter planted on terminal warm finger phalanx . Electrocardiography (ECG), were done for all patients, then ultrasonic examination of the heart by using, 2- D echocardiography, M- mode for assessment of cardiac function (EF, FS), camber size, cardiac wall thickness in addition to Doppler study of cardiac valves for detection of valvular complications and presence of regurgitation, and to exclude other cardiac wall defects or congenital anomaly.

The Growth Charts

Growth chart consists of an X axis which is usually age in years or months and a Y axis that changes according to the reference age. It can be height in cm or inches, weight in kg or body mass index (BMI) in kg/m2. The X axis is usually divided into 12 equal parts (months) for each year, but some countries such as United Kingdome use decimal ages where each year is divided into 10 parts. WHO Center for Disease Control and prevention (CDC) use 12 (monthly) divisions for each year (Ockenga, 2005). Standard growth chart has 7 percentile lines and include 3d,5th, 10 th, 25 th ,50 th, 75 th and 97 th percentiles (WHO, 2008).

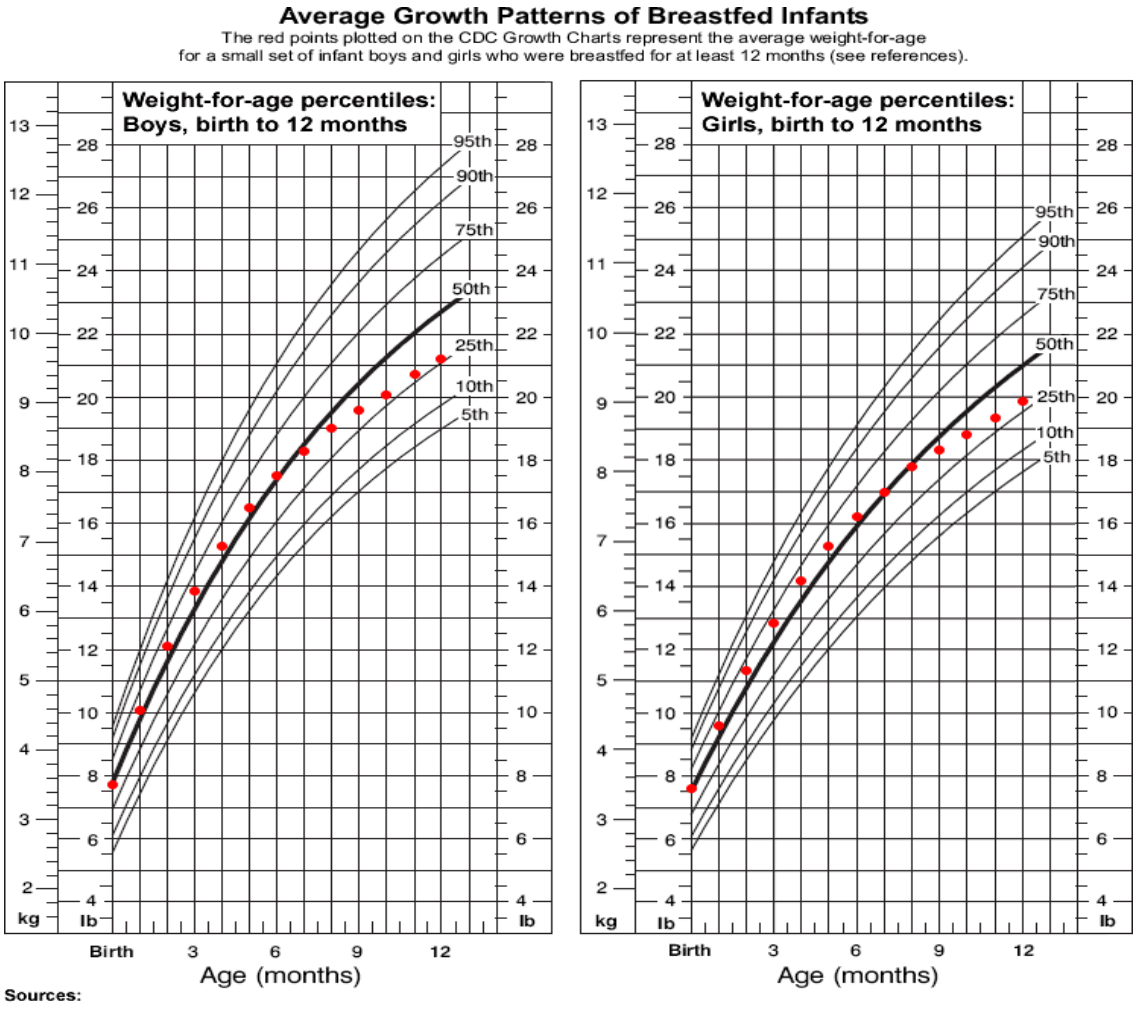


Figure (1) standard WHO growth chart for boys and girls infants 0-12 months.

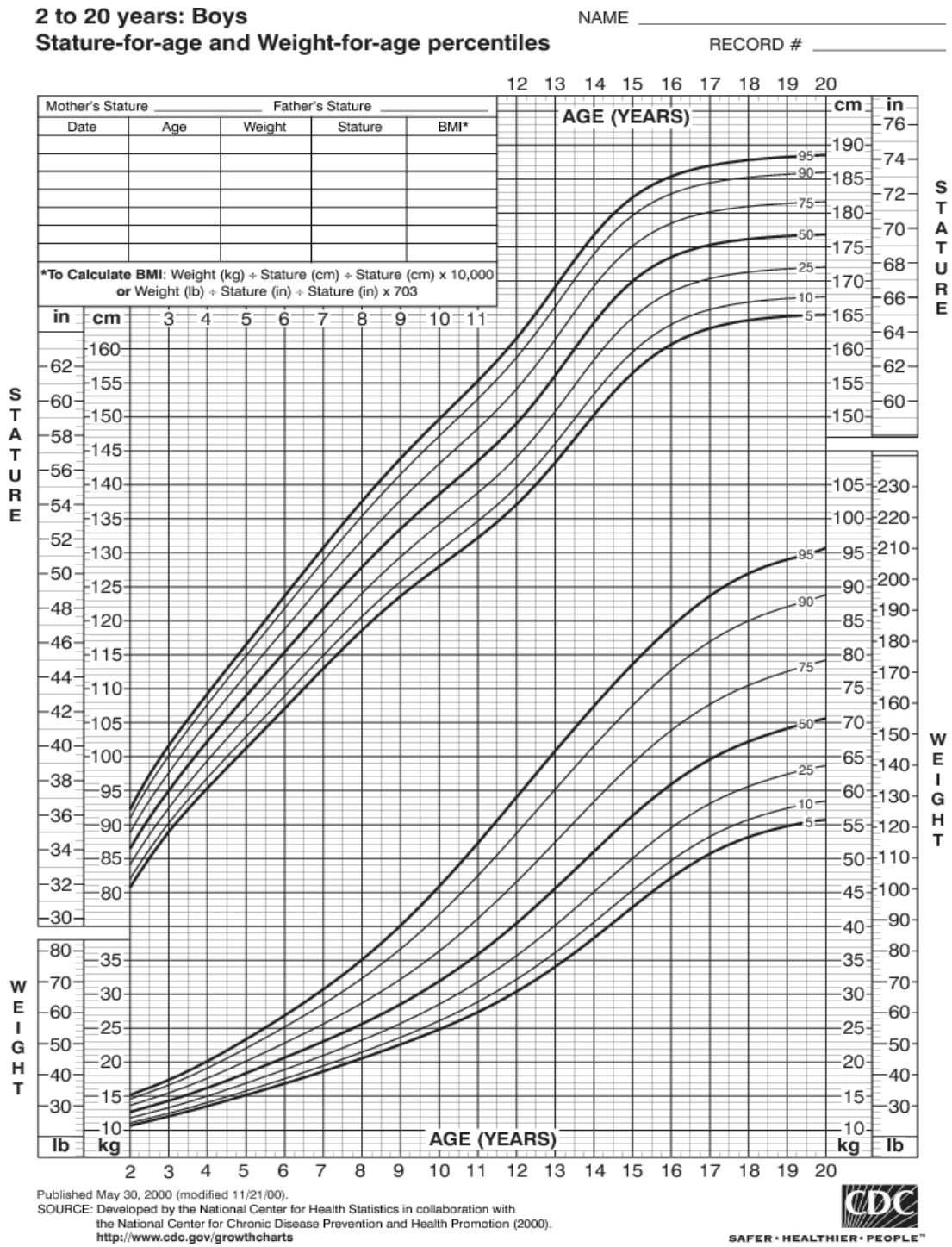


Figure (2)standard WHO growth chart for weight and height for boys 2- 20 years.

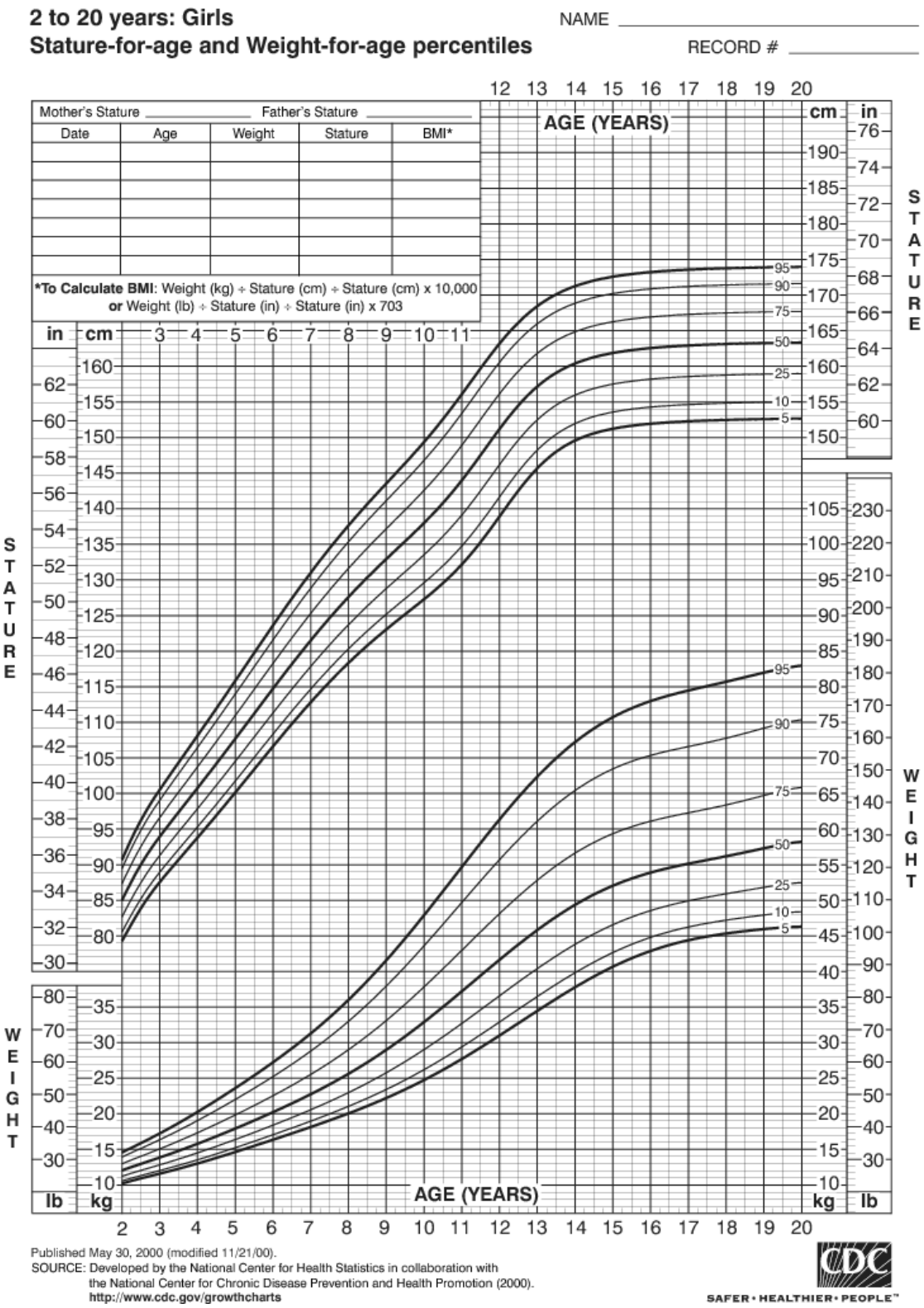


Figure (3) Standard WHO growth chart for weight and height for girls 2-20 years age.

Results

1-Dilated cardiomyopathy with acute LV dysfunction

Age distribution in patients and control groups

The study population included 15 patients had dilated cardiomyopathy (DCM) with acute LV dysfunction and the control population consisted of 15 normal subjects**.** There was insignificant difference in age between patient and control groups ($p > 0.05$) as shown in figure (4).

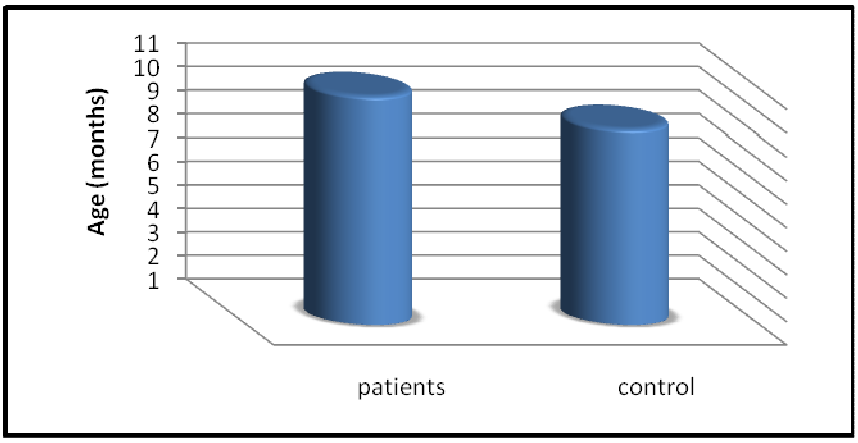


Figure (4): The mean age for patient and control groups.

Examination of studied group

Weight and height of the studied group:

At time of attendance , all patients and control group had normal weight and height but after one year, 66.7% of patients had normal weight and 33.3% had abnormal weight(below the 3d percentile age for weight) while 40% had normal height and 60% of patients had abnormal height (below the 3d percentile for height) and these results are of high statistical significance difference if compare with control group (P<0.01).as shown in table(1) .

Table(1): The weight and height of patient and control groups.

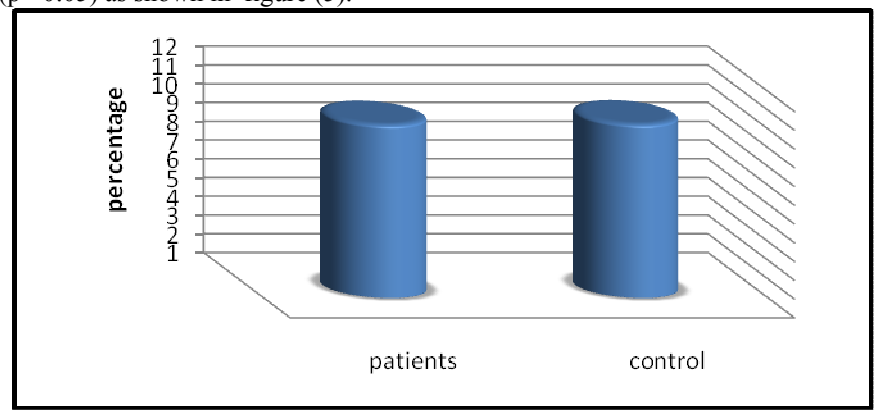
GROWTH		PATIENTS WITH ACUTE DCM				Control
		at time of attendance	after 3 months	after 6 months	after 1 years	
Weight kg	Normal	100%	53.3%	80%	66.7%	100%
	Below 3rd	0%	46.7%	20%	33.3%	0%
	Below 50th	0%	0%	0%	0%	0%
P value		-	0.001**	0.001**	0.001**	
Height cm	Normal	100%	53.3%	60%	40 %	100%
	Below 3rd	0%	40 %	40%	60%	0%
	Below 50th	0%	6.7%	0%	0%	0%
P value		-	0.001**	0.001**	0.001**	

2-Dilated Cardiomyopathy with chronic LV dysfunction

History of studied group

Age distribution in patients with DCM with chronic LV dysfunction and control groups

The study population included 33 patients with dilated cardiomyopathy (DCM) with chronic LV dysfunction and the control population consisted of 33 person **.** There was insignificant difference in age between patient and control groups (p >0.05) as shown in figure (5).



Figure(5) : The mean age for patient with chronic DCM and control groups.

Examination of studied group

Weight and height

Most patients with chronic DCM had abnormal weight and height and had significant difference with control group (P<0.01),regarding patients weight, at the time of attendance ,15.2% of patients with chronic DCM were have normal body weight, 69.7% of patient with DCM were below the 3d percentile (age for weight percentile), and 15.2% were below the 50th percentile for weight , while after one year 30.3% of patient had normal weight ,60.6% were below the 3d percentile with 9.15 of patients were below the 50th percentile for weight, and these results carried a high significant value .as shown in table(2).

Regarding patient height, at the time of attendance, 12.1% of children with chronic dilated cardiomyopathy had normal height , 54.5% were below the third percentile for height (age for height) and 33.3% were below the 50th percentile , after one year, 18.2% of patients had normal height ,63.6% were below the 3d percentile, while 18.2% were below the50th percentile, and these results also are of statistically highly significant values as shown in table (2).

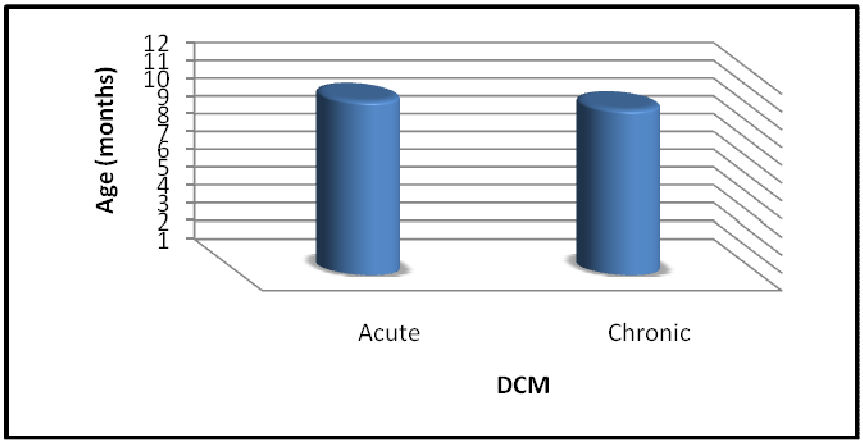
Table(2): The weight and height of patient and control groups.

GROWTH		Patients With Chronic DCM			Control
		at time of attendance	after 6 months	after 1 years	
Weight kg	Normal	15.2%	9.1%	30.3%	100%
	Below 3rd	69.7%	69.7%	60.6%	0%
	Below 50th	15.2%	21.2%	9.1%	0%
P value		0.001**	0.001**	0.001**	
Height cm	Normal	12.1%	9.1%	18.2%	100%
	Below 3rd	54.5%	60.6%	63.6%	0%
	Below 50th	33.3%	30.3%	18.2%	0%
P value		0.001**	0.001**	0.001**	

3- Patients with acute and chronic DCM

Age distribution in patients and control groups

There was insignificant difference in age between patient with acute and chronic DCM (p >0.05) as shown in figure (18).



Figure(6): The mean age for patient with acute and chronic DCM.

Examination of studied group

weight and height

There was a significant difference in weight between patient with acute and chronic DCM at time of attendance, after 6 month and after one year (p <0.05) as shown in figure (19).

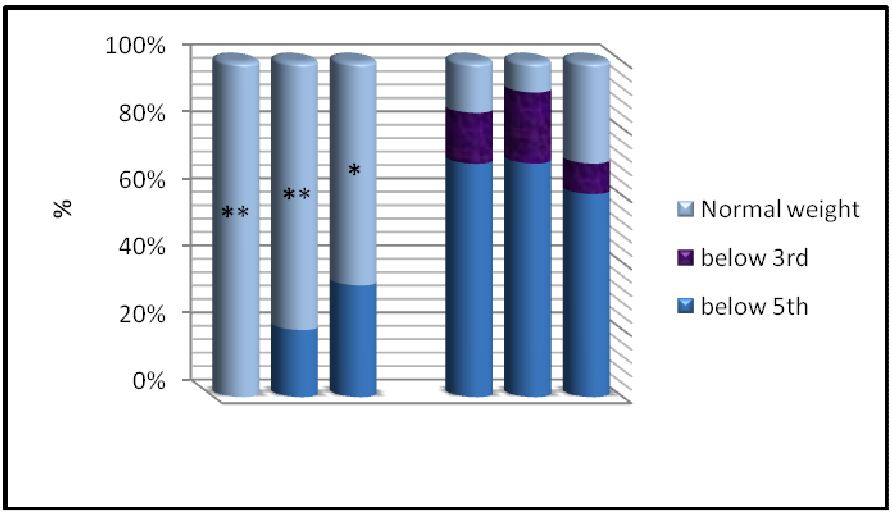


Figure (7): Weight in patient with acute and chronic DCM

Also There was a significant difference in height between patient with acute and chronic DCM at time of attendance and after 6 month ($p < 0.05$) as shown in figure (20).

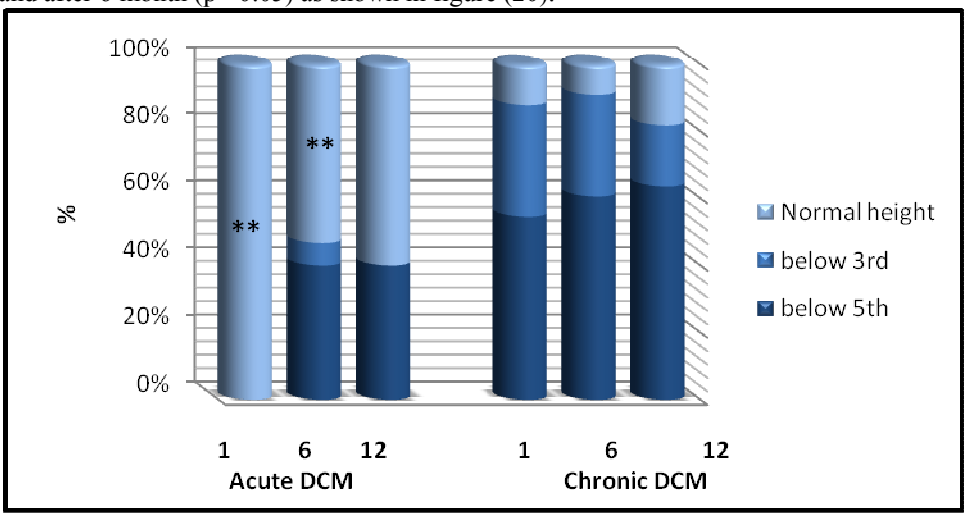


Figure (8): Height in patient with acute and chronic DCM

Discussion

1- Dilated cardiomyopathy with Acute LV dysfunction:

At time of attendance , all patients and control group had normal weight and height but after one year, 66.7% of patients had normal weight and 33.3% had abnormal weight(below the 3d percentile age for weight) while 40% had normal height and 60% of patients had abnormal height (below the 3d percentile for height) as shown in table (1) ,this is probably because of the fact that ,the heart is the vital organ that affect the growth through providing the perfect blood supply to all body organs and cells ,so the when there is decreasing in left ventricular function for long time, this will affecting blood supply to vital organs which interfere with nutrient absorption and growth of the child and this is consistent with other studies, that clarify the effect of heart failure on height and weight of the growing child .When there is a process of chronic disease affecting the child during the period of growth , the first to be affected is the weight parameter for the same causes mentioned before, the height parameter will be affected later on .In this study, about two third of the affecting child had their normal weight after one year (66.7%), due to the improvement in the cardiac function during one year of treatment , while about one third (33.3%), shows abnormal weight because of the still low cardiac function, and this what we found and is consistence with what other studies found like .While after one year treatment only 40% of the affected child had normal height and 60% had abnormal height, which may be due to the fact that, significant cardiac dysfunction affecting those children, resulting in malabsorption, decrease food intake, with high metabolic demand, leading to growth failure, which may be partially reversible ,leading to delayed growth and abnormal height for more than two third of patients after one year and this consistent with other studies.

2- Dilated cardiomyopathy with acute LV dysfunction:

Most patients with chronic DCM had abnormal weight and height and had significant difference with control

group ,regarding patients weight, at the time of attendance , only 15.2% of patients with chronic DCM were have normal body weight , 69.7% of patient with DCM were below the 3d percentile (age for weight percentile) ,and 15.2% were below the 50th percentile for weight, while after one year 30.3% of patient had normal weight ,60.6% were below the 3d percentile with 9.1% of patients were below the 50th percentile for weight, and these results carried a high significant value as shown in (table 2) ,this is most probably due to the long standing time of cardiac dysfunction that interfere with normal function of other systems including renal ,gastrointestinal ,endocrine and nervous system ,leading to decrease absorption of nutrients from intestine with low renal and endocrine function ,also it is mention that energy expenditure shown to be increased in children with chronic heart failure ,all these factors will affect growth (weight and height) , and this is consistent with the study of. Regarding patient height, at the time of attendance, 12.1% of children with chronic dilated cardiomyopathy had normal height, 54.5% were below the third percentile for height (age for height) and 33.3% were below the 50th percentile , after one year, 18.2% of patients had normal height ,63.6% were below the 3d percentile, while 18.2% were below the50th percentile as shown in (table 2) , most probably for the same causes mention above .

Conclusions

Most children with chronic dilated cardiomyopathy have delayed growth regarding weight and height with decrease hemoglobin level as compared with growth percentile for both Weight and Height and with normal hemoglobin level. The improvement in the cardiac function of some patients usually followed by increment in their body weight and height over the periods of follow up according to the growth charts of weight and height for their ages.

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