The role of Maximum Thigh Circumference as Screening test for Malnutrition in Tikrit Teaching Hospital

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Abstract

Worldwide, malnutrition is common and is responsible directly or indirectly for about a third of all deaths of children under 5 years of age. Primary malnutrition also continues to occur in developed countries as a result of poverty, parental neglect or poor education. Specific nutritional deficiencies, particularly of iron, remain common in developed countries. Restrictive diets may be iatrogenic as a result of exclusion diets or parental food fads, or may be self-inflicted.This study was done to determine the role of Maximum Thigh Circumference as screening test in early detection of malnutrition . A descriptive cross sectional study was done on children attending the pediatric department , and nutrition department in Tikrit Teaching Hospital from 15th March 2014 to 5th June 2014. The study included 160 Children, their age from (2months -5years). Each child included in the study was assessed by a prepared questionnaire. Screening done by measuring Weight for age, Height for age, Occipitofrontal Circumference for age, and Mid-arm circumference , and then diagnostic test done by depending on weight for height to confirm diagnosis or exclude malnutrition. The total number of cases 160 case (50% boys and 49% girls),45% from cases are malnourished and 54% with normal growth .ages range from 2month to 5 years .higher cases of malnutrition were females 57%. about 19 (47.5%) of normal children were females who lived in urban area, While 31 (65.9%) of males who lived in rural area were normal nutritional state. among malnourished children there were 24(77.4%), 34(80.9%) males and females subsequently lived in rural area . Most cases of malnutrition were in bottle feeding 63% and most cases of normal nutritional state were on mixed 24% and solid food 20% . It found that 33% (from 48cases) of normal males their mothers were on primary school and38%(from 39case)of normal females their mothers were on primary school also. 45% (from 33cases) of malnourished males their mothers were illiterate, read and write ,While 50%(from 40 case)of malnourished females their mothers were read and write . Anthropometric measures , Mid-Upper arm Circumference(MUAC) is highly sensitive test 91% for detection of malnutrition and Wt/age is specific test 92%. Mean Maximum Thigh Circumference (MTC) for normal male:(21+/-3)& for malnourished male :(14+/-3). Mean MTC for normal female :(21+/-2) &for malnourished female :(15+/-3). The sensitivity of MTC is high in females 97%and specific in males 81%.

Finally the present study concluded that the using of maximum thigh circumference is a good method to detect early malnourished cases .

Introduction

Worldwide, protein-energy malnutrition is a leading cause of death among children younger than 5 years old. protein-energy malnutrition is a spectrum of conditions caused by varying levels of protein and calorie deficiencies.(1)

Primary protein-energy malnutrition is caused by social or economic factors that result in a lack of food.

Secondary protein-energy malnutrition occurs in children with various conditions associated with

increased caloric requirements (infection, trauma, cancer), increased caloric loss (malabsorption), reduced caloric intake (anorexia, cancer, oral intake restriction, social factors), or a combination of these three variables.(1) Protein and calorie malnutrition may be associated with other nutrient deficiencies, which may be evident on the physical examination.

Maximum thigh circumference(MTC):

Maximum thigh circumference of 0-2 year old infant has not previously been studied , although Snyder (1977) has published norms for 2.5-5 years old. This paper provide a reference standard for using thigh circumference as simplified screening index (similar to mid-arm circumference but proven to be slightly more consistent)for selecting malnourished infant & young children.(5)

Aim of the study

This study aims is to evaluate the role of maximum thigh circumference as screening test for malnutrition .

Patients and Methods

This study was carried out in pediatrics &nutritional department in Tikrit Teaching Hospital in Tikrit city. A descriptive cross sectional study was done on children attending the pediatric department (outpatient or inpatient), and nutrition department in Tikrit Teaching Hospital from 15th March 2014 to 5th July 2014.

Before assessment of each children included in the study acceptance from their father or the mother of the children were taken. The study included 160 Children, their age from (2months -5years). Each child included in the study was assessed by a prepared questionnaire which include socio-demographic factors (name, age, gender, residence, type of feeding and educational level of the mother), data collected by direct interview with child's parent then each child was assessed for weight, height, occipitofrontal circumference, Mid-Upper arm circumference and then use special charts according to sex. Educational level of the mother was classified into: illiterate ,read and writing , primary school , secondary school , and collage and higher education .(6)Screening done by measuring Weight for age, Height for age, Occipitofrontal Circumference for age, and Mid-arm circumference , and then diagnostic test done by depending on weight for height to confirm diagnosis or exclude malnutrition. Weight was assessed by using digital scale with little clothes, Children who can stand was weighed using UNICEF digital scale (MMK) and those

children whose can't standing ,by weighing firstly the mother holding the baby and reading saved then the mother weighted only and the reading saved and subtracted from initial reading(7) . Children considered as low weight when the weight of the children fall below 5th percentile for age and sex . Height was assessed according to the age of the child. If the children were below 2 year of age the supine length was assessed by Non- stretchable fiberglass tape measure fixed on flat hard board. While children over 2 year of age was assessed by standing height using stadiometer (MMK) children should be assessed with bear foot with the back, the feet and the occiput touching the wall and the baby looking straight(7). Children consider as short when height fall below 5th percentile for age and sex . Head circumference was assessed by measuring occipitofrontal diameter with at least two measures taking the largest one using Non–stretchable fiber glass tape measure(6). Children consider as small head when OFC fall below 5th percentile for age and sex . Weight for Height was assessed by a special WHO chart using the weight and height of the children irrespective to age, and children were divided into mean (normal),-1,-2.-3&-4 SD, below the Mean (Malnourished cases).(7) . Mid-Upper Arm Circumference was assessed by taking the arm circumference at the mid–way between the ocromion and the olecranon with the arm in the resting posture, consider as

malnourished when <11.5 and consider normal when >11.5 (84). The Maximum Thigh Circumference was assessed by Non-stretchable fiber glass tape measure at mid–Point between greater trochanter & upper edge of the patella. The thigh put in extended posture using the Right thigh. There was no reference value for normal or abnormal thigh girth in children although there was reference value for adult (6).

Inclusion Criteria :

1. Children between two month and five years of age.
3. Children who complete the questionnaire and the anthropometric measures.

Exclusion Criteria:

1. Children below 2 month of age because those children were not included in WHO program for malnutrition as these cases may be a cases of prematurity with Failure to Thrive .
2. Children above 5 years of age because those children were not included in WHO program for malnutrition as these cases were not family dependant for provision of diet so most of these cases of malnutrition above 5 years usually of organic cause .
3. Children who didn't complete the questionnaire and anthropometric measures.
4. Children on tonics and anabolic steroid .
5.childern with over weight .

Results

The total number of cases 160 case (50% boys and 49% girls),45% from cases with malnutrition and 54% with normal growth .

4.1: The mean values of Maximum thigh circumference (MTC) among healthy and malnourished children:

The mean value of Maximum Thigh Circumference for the normal females were(21 +/- 2) and for malnourished females were (15+/-3) and for normal males (21 +/-3) and for malnourished males were (14 +/-3).

Table (1) show the MTC is sensitive (87%) and specific (81%) as screening test for detection of malnutrition in males . from (48) normal cases as screening test discovered them there were (42) cases assured by diagnostic test ,and from (33) malnourished cases there were (6) assured by diagnostic test as diseased cases .

Table (2) show that the sensitivity of MTC as screening test in females is (97%) ,(highly sensitive) and the specificity is (77%).

The Relation between Age and Gender among Malnuorished Children :

In regard to malnutrition cases, there were 24 male (from age 2 month to 12 month) and 23 female (from age 2month to 12 month).

Figure (1)show that, 72% (24) cases from total malnourished males (33),were between age (2month -1year).

Type of Feeding :

Table (3) show distribution of cases according to type of feeding. It found that 27% from normal males(48 case) were on solid food and 25%on bottle and mixed feeding, While In normal females it found that 46% from(40case) were on mixed feeding, 23% on breast feeding .

Table (4) show distribution of cases according to type of feeding. It found that 66% from malnourished males (33case) were on bottle feeding. While malnourished females 60% (from 40 cases) were on bottle feeding .

The sensitivity and specificity of the anthropometric measurements among children as diagnostic measures for malnutrition:

The Wt/Ht measure were used as diagnostic test and Wt/age ,Ht/age ,OFC/age and Mid-upper arm circumference as screening test for malnutrition .

Table (5) show that, Wt/age is highly specific (92%) as screening test and the sensitivity is (79%). From(81) malnourished cases as screening test discovered them ,there were (77) assured by diagnostic test .

Table (6)show that the MUAC is highly sensitive (91%) and specific (82%) as screening test for malnutrition. From (106) malnourished cases as screening test discovered them there were (97) cases assured by diagnostic test and from (52)

normal cases ,there were (9) assured by diagnostic test .

Table (7) show that the sensitivity of Ht/age as screening test is (77%), While specificity is (65%). From (99)malnourished cases as screening test discovered them ,there were (81) case assured by diagnostic test and from (58) normal cases there were (24) cases assured by diagnostic test as free of disease .

Table(8) show that the sensitivity of OFC/age as screening test (88%) and the specificity (62%)(non specific).

Discussion

Worldwide, malnutrition is common and is responsible directly or indirectly for about a third of all deaths of children under 5 years of age. Primary malnutrition also continues to occur in developed countries as a result of poverty, parental neglect or poor education(9). Specific nutritional deficiencies, particularly of iron, remain common in developed countries. Restrictive diets may be iatrogenic as a result of exclusion diets or parental food fads, or may be self-inflicted. Malnutrition also occurs in 20–40% of children in specialist children's hospitals. At particular risk are those with chronic illness: e.g. the preterm, congenital heart disease, malignant disease during chemotherapy. or bone marrow transplantation, chronic gastrointestinal conditions such as short gut syndrome, following extensive bowel resection or inflammatory bowel disease, chronic renal failure or cerebral palsy(10). Malnutrition results from a combination of anorexia, malabsorption and increased energy requirements because of infection or inflammation(11). Malnutrition in older children and adolescents may also result from eating disorders. In addition to weight and height, skin fold thickness of the triceps reflects subcutaneous fat stores and can be assessed by measuring it. While it is difficult to measure skin fold thickness accurately in young children, mid upper arm circumference, which is related to skeletal muscle mass, can be measured easily and repeatedly and is independent of age in children 6 months to 6 years. It is especially useful for screening children for malnutrition in the community.(12)

Maximum Thigh Circumference :

MaximumThigh Circumference for normal males higher than normal females ,While for malnourished males were lower than malnourishedfemales. The sensitivity of MTC is high in females 97%and specific in males 81%. There is no other study to compare with this results. This may be that muscle bulk on female more than male .

Sensitivity and specificity of Anthropometric measures .

Maximum Upper Arm Circumference is highly sensitive test for detection of malnutrition and Wt/age is highly specific test .This does not goes with study in UK by Burden ST, Stoppard E, Maximum Upper arm Circumference<5th percentile had a high specificity but low sensitivity when compared with indicators of malnutrition. Although MUAA could be reliably measured, it has poor validity and is thus unlikely to be a good predictor of clinical outcome. Percentiles based on healthy populations do not generalize well to the individuals seen in clinical practice. Other study done in Kasturba by Mohanan P, Kamath A, the best method of assessing malnutrition using various anthropometric measurements is weight for age.(13)

Conclusions

MaximumThigh Circumference for normal males higher than normal females ,While for malnourished males were lower than malnourished females. Anthropometric measures ,MUAC is highly sensitive test 91% for detection of malnutrition and Wt/age is specific test 92% . The sensitivity of MTC is high in females 97%and specific in males 81%.

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Table (1): the use of MTC as screening test and Wt/ht as diagnostic test in males:

Screening test MTC	Diagnostic test Wt/Ht		
	Normal	**Malnourished**	**Total**
Normal	42	6	48
Malnourished	6	27	33
Total	48	33	81
Sensitivity =87% false +ve test :18% predictive value+ve :87% Specificity =81% false –ve test: 12.5% predictive value –ve:81.8% Mean MTC for normal male:(21+/-3) Mean MTC for malnourished male :(14+/-3)			

Table (2): the use of MTC as screening test and Wt/ht as diagnostic test in females :

Screening test MTC	Diagnostic test Wt/Ht		
	Normal	**Malnourished**	**Total**
Normal	38	9	47
Malnourished	1	31	32
Total	39	40	79
Sensitivity:97% false +ve test :22.5% predictive value+ve :80% Specificity =77% false –ve test: 2.5% predictive value –ve:96.8% Mean MTC for normal female :(21+/-2) Mean MTC for malnourished female :(15+/-3)			

Table (3): Relation between Gender and Type of Feeding among Normal Nutritional State Children :

Normal	**Bottle feeding**		**Breast feeding**		**Mixed feeding**		**Solid food**		**Total no.**
Male	Number	percentage	number	percentage	Number	percentage	Number	percentage	**48**
	12	**25%**	**7**	**14%**	**12**	**25%**	**13**	**27%**	
Female	**7**	**17%**	**9**	**23%**	**18**	**46%**	**5**	**12%**	**39**
Total									**87**

Table (4): Relation between Gender and Type of Feeding among Malnourished Children :

Maln.	Bottle feeding		Breast feeding		Mixed feeding		Solid food		Total no.
Male	Number	percentage	number	percentage	Number	percentage	Number	percentage	33
	22	66%	2	6%	9	27%	zero	zero%	
Female	24	60%	4	10%	12	30%	zero	zero%	40
Total									73

Table (5): the use of Wt/age as screening test and Wt/Ht as diagnostic test in children :

Screening test Wt/age	Diagnostic test Wt/Ht		
	Malnourished	Normal	Total
Malnourished	77	4	81
Normal	20	49	69
Total	97	53	150

Sensitivity =79% false +ve test :7.5% predictive value+ve :95%
Specificity =92% false –ve test: 20% predictive value –ve:71%

Table (6): the use of MUAC as screening test and Wt/Ht as diagnostic test in children :

Screening test MUAC	Diagnostic test Wt/Ht		
	Malnourished	Normal	Total
Malnourished	97	9	106
Normal	9	43	52
Total	106	52	158

Sensitivity =91% false +ve test :17% predictive value+ve :83%
Specificity =82% false –ve test: 9% predictive value –ve:82%

Table (7): the use of Ht/age as screening test and Wt/Ht as diagnostic test in children :

Screening test Ht/age	Diagnostic test Wt/Ht			
		Malnourished	Normal	Total
	Malnourished	81	18	99
	Normal	24	34	58
	Total	105	52	157
Sensitivity =77%	false +ve test :34%		predictive value+ve :81%	
Specificity =65%	false –ve test: 22%		predictive value –ve:58%	

Table (8): the use of OFC/age as screening test and Wt/Ht as diagnostic test in children :

Screening test OFC/age	Diagnostic test Wt/Ht			
		Malnourished	Normal	Total
	Malnourished	89	19	108
	Normal	12	31	43
	Total	101	50	151
Sensitivity =88%	false +ve test :38%		predictive value+ve :82%	
Specificity =62%	false –ve test: 11%		predictive value –ve:72%	

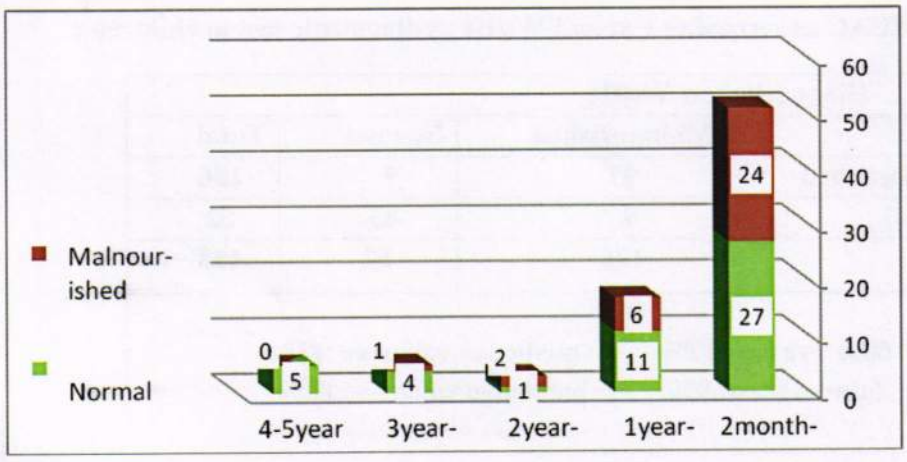

Figure (1):the relation between age and nutritional state among males .