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Evaluation of waist to hip ratio as a screening tool for malnutrition among children under 5 years age at Kirkuk Pediatric General hospital

ABSTRACT:

Background Worldwide, malnutrition is common and is responsible directly or indirectly for about a third of all deaths of children under 5 years of age. **Aim** of the study For early detection of patients with malnutrition by using WHR as screening tool.

Patients and method : A case control analytic study was done on children attending the Pediatric General Hospital in Kirkuk, and Nutrition Department in Pediatric General Hospital in Kirkuk from 29th March 2015 to the last of August 2015. The study included 250 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, Occiputo - frontal Circumference for age, and Mid-arm circumference , and the diagnostic test was weight for height as well as waist to hip ratio as screening test.

Results : The total number of cases (150 case) were malnourished , their age range from 2month to 5 years , while (100 case) of same age range considered as control .Most cases of malnutrition were males 63% , and 37% were females ,while higher number of control cases were male 65% , while female were 35% .

Regarding the anthropometric measures ; waist Circumference in male were 74% sensitive and 57% specific , while in female were 71% sensitive and 30% specific . Hip Girth (HG) in male were 76% sensitive ,48% specific , but in female 76% were sensitive , 40% specific . Waist to Hip Ratio (WHR) not sensitive , but 100% specific in male and female . Mean waist circumference for control male:(41±3) , and for malnourished male :(37±1) ; while mean waist circumference for control female :(42±2) , and for malnourished female:(34±2). Mean hip girth (HG) for control male:(41±3), and for malnourished male :(37±2) ;while HG for control female :(43±2) , and for malnourished female :(36±1). Mean WHR in control male :(1±0.3) ,but in malnourished male :(1.02±0.2) ; while WHR in control female :(0.97±0.5) , but in malnourished female :(0.94±0.5. (

Conclusion : Still MAC is the most sensitive and specific method for screening for malnutrition , and hip girth is a good method for early detection of malnutrition , although it is less sensitive than MAC

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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)

The measurement of waist circumference (WC) is considered to be an important means to control weight in general.(3)

Waist circumference is a highly sensitive and specific measure of upper body fat in young people and so should be valuable for identifying overweight and obese children at risk of developing metabolic complications.(4,5)

The hip girth is measured at its widest portion of the buttocks, at the greater trochanters.(6)

Yet no reference value obtained for HG in patients with malnutrition, as well as healthy children under 5 years.

The WHR till now is used as screening tool for obesity, but till now no reference study was undertaken this tool as screening test for malnutrition.(7)

In addition there is no reference value for (WR,HG and WHR)in malnourished patient were obtained as well as no reference value for the above three measures were obtained for normal apparently healthy children under 5 years of age.

That's why this study is considered to obtain a primary reference value for the above measures for healthy children as well as malnourished patient.

Aim of the study : For early detection of patients with malnutrition by using different anthropometric measures as screening tool.

Patient and Methods:

This study cases (malnourished cases) were taken from the general pediatric ward and rehabilitation ward for malnutrition cases. A case control hospital based selective study were done on patients with malnutrition attending General Pediatric Hospital in Kirkuk during the period from 29th of March to the last of August 2015 aged from 2 month_5 years. A comparable number of apparently healthy children with normal Wt/Ht of similar age group were taken as a control group.

The anthropometric measurements were measured for each case included in the study (both malnourished and study cases).These include Wt/age , Ht/age ,OFC/age ,Wt/Ht , MAC , Waist circumference , Hip girth and WHR:

Waist circumference were measured for each malnourished and control cases. The measure taken 1 inch above the umbilicus with the patient standing or holding upright by

his or her parents if the child is not able to stand . Two measurement were taken , and if the difference was $<1\text{cm}$, the mean of the two measures were taken , and if the difference $>1\text{cm}$ the measure repeated. The mean +or_ standred deviation were taken for the malnourished cases as well as control.

Hip girth were measured for both malnourish and control cases . The measure taken at the widest part of the hip (at the level of greater trochanter) taken twice , then the mean of the two measure taken. The mean +or_

SD for the whole malnourished and the control cases were considered.

After measurement of waist circumference and hip girth , the ratio between the two measure taken , and then the mean of the total ratios for malnourished and control cases were taken.

In this study study the measurement of waist circumference, hip circumference, and WHR, of control cases were considered as the reference value for malnourished cases .

Results

The total number of cases (150 case) were malnourished , their age range from 2month to 5 years , while (100 case) of same age range considered as control .Higher cases of malnutrition were males 63% , and 37% were females ,while higher number of control cases were male 65% , while female were 35% .

Table (1A) sows the distribution of Study Cases According to Maternal Educational Level. Most of the cases were illiterates (50.6%)

Table (1A) Distribution of Study Cases According to Maternal Educational Level:

Maternal Educational Level	No	%
Illiterates	76	50,6
Primary school	43	28,6
Secondary school	18	12
College	13	8,6
Total	150	100%

P- value <0.05 (significant)

Table (4_1 B) shows the Distribution of Control Cases According to Maternal Educational Level. Most of the cases were of secondary school 67%.

Table (1B) Distribution of Control Cases According to Maternal Educational Level:

Maternal Educational Level	No	%
Illiterates	15	15%
Primary school	10	10%
Secondary school	67	67%
College	8	8 %
Total	100	100%

Table (2A) shows The distribution of the control cases according to waist circumference, hip girth and waist to hip ratio . The mean values fpr females were higher than that of males.

Table (4_2 A) : The distribution of the control cases according to waist circumference, hip girth and waist to hip ratio.

Measures	Male	Female
Mean waist circumference	41±3	42±2
Mean hip girth	41±3	43±2
Mean waist to hip ratio	1± 0.3	0,97± 0,5

Table (2B) shows the distribution of the study cases according to waist circumference, hip girth and waist to hip ratio. The mean values for males were higher than females.

Table (4_2 B) : The distribution of the study cases according to waist circumference, hip girth and waist to hip ratio:

Measures	Male	Female
Mean waist circumference	37±1	34±2
Mean hip girth	37±2	36±1
Mean waist to hip ratio	1,02± 0.5	0,94± 0,5

Table (3) shows the use of Wt/age as screening test and Wt/Ht as diagnostic test in children. It was sensitive in 73% and specific was in 75%.

Table (3): 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	96	16	112
	Normal	21	17	38
	Total	117	33	150
Sensitivity = 73 %	false +ve test : 25 %	predictive value+ve : 91 %		
Specificity = 75 %	false -ve test: 23 %	predictive value -ve: 45 %		

Table (4) shows the use of MAC as screening test and Wt/Ht as diagnostic test in children. It was sensitive in 75% and specific in 79%.

Table (4): the use of MAC as screening test and Wt/Ht as diagnostic test in children :

Screening test MAC	Diagnostic test Wt/Ht			
		Malnourished	Normal	Total
	Malnourished	88	7	95
	Normal	29	26	55
	Total	117	33	150
Sensitivity = 75 %	false +ve test : 21 %	predictive value+ve : 93 %		
Specificity = 79 %	false -ve test: 25 %	predictive value -ve: 47 %		

Table (4_5) shows the use of waist circumference as screening test and Wt/ht as diagnostic test in males. It was sensitive in 74% and specific in 57%.

Table (4_5): the use of waist circumference as screening test and Wt/ht as diagnostic test in males:

Screening test Waist circumference	Diagnostic test Wt/Ht				
	Malnourished	Normal	Total		
Malnourished	53	10	63		
Normal	19	13	32		
Total	72	23	95		
Sensitivity = 74 %	false +ve test : 44 %	predictive value+ve : 84 %			
Specificity = 57 %	false -ve test: 26 %	predictive value -ve: 57 %			
Mean waist C. for normal male: (41±3)					
Mean waist C. for malnourished male : (37±1)					

Table (6) shows the use of waist C. as screening test and Wt/ht as diagnostic test in females . It was sensitive in 71% and specific in 30%.

Table (6): the use of waist C. as screening test and Wt/ht as diagnostic test in females :

Screening test Waist C.	Diagnostic test Wt/Ht		
	Malnourished	Normal	Total
Malnourished	32	7	39
Normal	13	3	16
Total	45	10	55

Sensitivity: 71 % false +ve test : 70 % predictive value+ve : 82 %
 Specificity = 30 % false -ve test: 29 % predictive value -ve: 19 %
 Mean waist C. for normal female :(42±2)
 Mean waist C. for malnourished female :(34±2)

Table (7) shows the use of hip girth as screening test and Wt/ht as diagnostic test in males. It was sensitive in 76 % and specific in 48%.

Table (7): the use of hip girth as screening test and Wt/ht as diagnostic test in males:

Screening test Hip girth	Diagnostic test Wt/Ht		
	Malnourished	Normal	Total
Malnourished	55	12	67
Normal	17	11	28
Total	72	23	95

Sensitivity = 76 % false +ve test : 52 % predictive value+ve : 82 %
 Specificity = 48 % false -ve test: 24 % predictive value -ve: 39 %
 Mean hip girth for normal male:(41±3)
 Mean hip girth for malnourished male :(37±2)

Table (8) shows the use of hip girth. as screening test and Wt/ht as diagnostic test in females . It was sensitive in 76% and specific in 40%.

Table (8): the use of hip girth. as screening test and Wt/ht as diagnostic test in females :

Screening test Hip girth	Diagnostic test Wt/Ht		
	Malnourished	Normal	Total
Malnourished	34	6	40
Normal	11	4	15
Total	45	10	55

Sensitivity: 76 % false +ve test : 60 % predictive value+ve : 85 %
 Specificity = 40 % false -ve test: 24 % predictive value -ve: 27 %
 Mean hip girth for normal female :(43±2)
 Mean hip girth for malnourished female :(36±1)

Table (9) shows the use of waist C. /hip G. as screening test and Wt/ht as diagnostic test in males. It was sensitive in 0% and specific in 100%.

Table (9): the use of waist C. /hip G. as screening test and Wt/ht as diagnostic test in males:

Screening test Waist/Hip ratio	Diagnostic test Wt/Ht		
	Malnourished	Normal	Total
Malnourished	0	0	0
Normal	72	23	95
Total	72	23	95

Sensitivity = 0 % false +ve test : 0 % predictive value+ve : 0 %
 Specificity = 100 % false -ve test: 76 % predictive value -ve: 24 %
 Mean Waist/Hip ratio for normal male:(1±0.3)
 Mean Waist/Hip ratio for malnourished male :(1.02±0.2)

Table (10) shows the use of waist C./hip G.. as screening test and Wt/ht as diagnostic test in females . It was sensitive in 0% and specific in 100%.

Table (10): the use of waist C./hip G.. as screening test and Wt/ht as diagnostic test in females :

Screening test Waist/hip ratio	Diagnostic test Wt/Ht		
	Malnourished	Normal	Total
Malnourished	0	0	0
Normal	45	10	55
Total	45	10	55

Sensitivity: 0 % false +ve test : 0 % predictive value+ve : 0 %
 Specificity = 100 % false -ve test: 100 % predictive value -ve: 18 %
 Mean Waist/Hip ratio for normal female :(0.97±0.5)
 Mean Waist/Hip ratio for malnourished female :(0.94±0.5)

Discussion

Primary malnutrition also continues to occur in developed countries as a result of poverty, parental neglect or poor education.⁽⁸⁾ 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.

Waist circumference(WC) were sensitive but less specific than MAC in both male and female , and hip girth(HG) also less specific than MAC . Waist circumference and hip girth traditionally were used for assessment of obesity by obtaining the waist to hip ratio due to the fact that the waist and the hip is the areas of fatty cell deposition and the difference in the ratio among the obese child related to the type of obesity , as there was three types of obesity according to BMI, and as one of the most important sign of malnutrition is thinness (loss of subcutaneous fat), these measures (waist circumference and hip girth) may be affected by fat deficiency because they were the areas of fatty collection in the body . Still there were no reference value for waist circumference and hip girth among normal Iraqi children , so the control cases in this study obtained a preliminary value for mean \pm SD for both waist circumference(WC) and

hip girth(HG) which is used in this study to assess the difference in these measures among the malnourished cases , and it can be used by other researchers for amore wide and a longer period similar study .

- **Waist to Hip Ratio (WHR) :**

WHR were not sensitive , but highly specific among the control as well as the malnourished cases .

WHR among the control cases considered as reference value for this study there 's no reference value for WHR among normal Iraqi children .

WHR among malnourished cases were not sensitive but highly specific , and in fact the result obtained were same to that of results used to diagnosed obesity .

The reason why the ratio were very high among the malnourished cases is that both (WC) and (HG) decreased at the same time and so the ratio is not affected and it give us a result similar to that of obese patients , and this also through a light for a larger study cases and a longer period of time to stablish wither the WHR is useful as a screening test for malnutrition and raise a question mark regarding the use of this ratio as a screening test for obesity as this ratio also increased in malnourished , although BMI is a diagnostic for obese patient is more accurate than WHR. .

Conclusion: Waist Circumference , hip girth for control female higher than control male ,While for malnourished female were lower than malnourished male. The in both cases.

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