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THE FREQUENCY of ASYMPTOMATIC BACTERIURIA AMONG HEALTHY and MALNOURISHED CHILDREN under 5 YEARS AGE at SALAH ALDEEN GENERAL HOSPITAL

ABSTRACT

Background: Malnutrition is considered the most important public health problem in children in the developing countries and risk factor for the burden of diseases which associated with impairment of immunity that aggravate infections including asymptomatic bacteriuria and urinary tract infection. There was a significant association between asymptomatic bacteriuria and the malnourished children that may have predisposed them to urinary tract infection, so urine from all such children should be routinely screened for the presence of asymptomatic bacteriuria and appropriate antibiotic should be given if the culture is positive.

Aim: The aim of this study is to decrease morbidity among malnourished children by early detection of asymptomatic bacteriuria.

Pateints and methods : A cross sectional descriptive study was done on patients aged 2 months to 5 years with malnutrition attending the rehabilitation ward and the outpatient clinic at Salah_Aldeen General Hospital during the period from 1st of February to the last of the June 2019. The study involved 110 child who were divided into 2 groups (cases and control group). Each case included in the study was assessed initially by a prepared questionnaire that included name, age, sex ...etc. and presence of signs of malnutrition as where as assessed for some anthropometric measures used in the assessment of nutritional states which include weight, height and weight for height. Both study and control cases were sent for urinalysis, urine culture and abdominal ultrasound.

Results : Significant asymptomatic bacteriuria was found in 65.5% of malnourished cases and 34.5% in control children. This study also showed that asymptomatic bacteriuria in malnourished children increase in rural area was 73.9%, also increased with low educational level of the mother. The most common age of bacteriuria was under 3 years and more common in female, also asymptomatic bacteriuria was more common in bottle fed than breast fed. The risk of bacteriuria not increased by severity of malnutrition. This study showed that *Escherichia coli* was the most common micro-organism in both cases and control group.

Conclusion : It is concluded that asymptomatic bacteriuria is a significant problem among malnourished patients which need early diagnosis to prevent further complications. The malnourished patient should be routinely screened for the presence of asymptomatic bacteriuria to decrease morbidity in these patients, also assessment, management and evaluation of urinry tract infection is recommended, because symptoms of urinary tract infection in children often vague and not specific.

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Introduction

Malnutrition is one of the major public health problems associated with increased risk of morbidity which affect one third of children world wide and frequently seen in the less developed countries due to inadequate food or socioeconomic factors .[1] Children with malnutrition have impaired immune function. Thus early detection and prompt treatment of associated infection in children with malnutrition are very important.[2] Urinary tract infection (UTI) is a common health problem in children. Its occurrence depends on several predisposing factors and individual immunocompetence.[3]

Due to presentation of UTI in undernourished population, urine from all such children should be routinely screened for the presence of asymptomatic bacteriuria (ASB) and appropriate antibiotic should be given if the culture is positive.[4]

In healthy children, proliferation of bacteria can be prevented by flow of urine and presence of local mucosal bladder antibody system but children with malnutrition have impaired immune function [5,6] including depressed hypersensitivity response, low secretion of immunoglobulin A (IgA) and decreased phagocytosis.[7] From global reports, there is overwhelming evidence to suggest that children with Protein Energy Malnutrition (PEM) have increased risk of UTI, although prevalence rates range from as low as 6% to as high as 37%. These findings have formed the basis for the current diagnostic and therapeutic guidelines for clinicians managing children with complicated PEM.[8]

The Aim of Study : The aim of this study was to decrease morbidity among malnourished children by early detection of asymptomatic bacteriuria.

Patients and Methods

A cross sectional descriptive study was done on patients aged 2 months to 5 years with malnutrition attending the Rehabilitation Ward and the outpatient clinic at Salah_Aldeen General Hospital in Tikrit during the period from 1st of February to the end of June 2019. Before starting the study, oral acceptance from the relative of the patients was taken. Each case included in the study was assessed initially by a prepared questionnaire that included name, age, sex...etc..

Each case was assessed for presence of signs of malnutrition with some anthropometric measures used in the assessment of nutritional states which include weight, height and weight for height.

Weight was assessed by UNICEF digital scale with minimal clothes with two measures taken and the mean weight was calculated. The height was assessed by standiometer for those patients over 2 years age in standing posture and taken while the patient supine in those under 2 years age.

Weight for height (WFH) was taken by measuring the weight and the height as above. Each measure was put on standard growth charts. The patient diagnosed as normal, mild, moderate and severe malnutrition according to Waterlow classification using WFH parameter .

RESULTS

The total number of patients in this study was 110 children. They were divided into two groups, malnutrition group included 50 patients (19 male and 31 female) diagnosed with malnutrition, and control group included 60 well-nourished children(34 male and 26 female).

The distribution of study groups according to general characteristics is shown in Figure 4-1 and 4-2 and Table 4-1. Study patient's age was ranging from 2 to 60 months with a mean of 2.25 years and SD of ± 1.58 years. The highest proportion of study patients in malnutrition and control group was aged < 2 years (56% and 40% respectively).

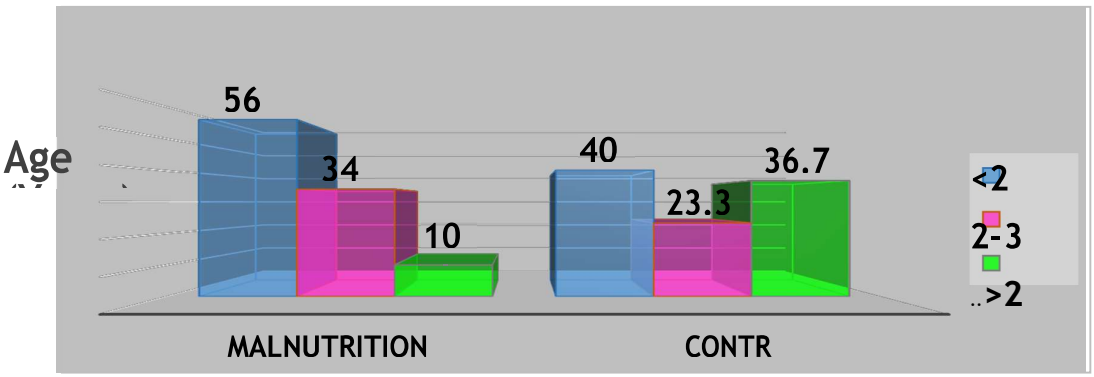

Figure4. 1: Distribution of Study Groups according to age.

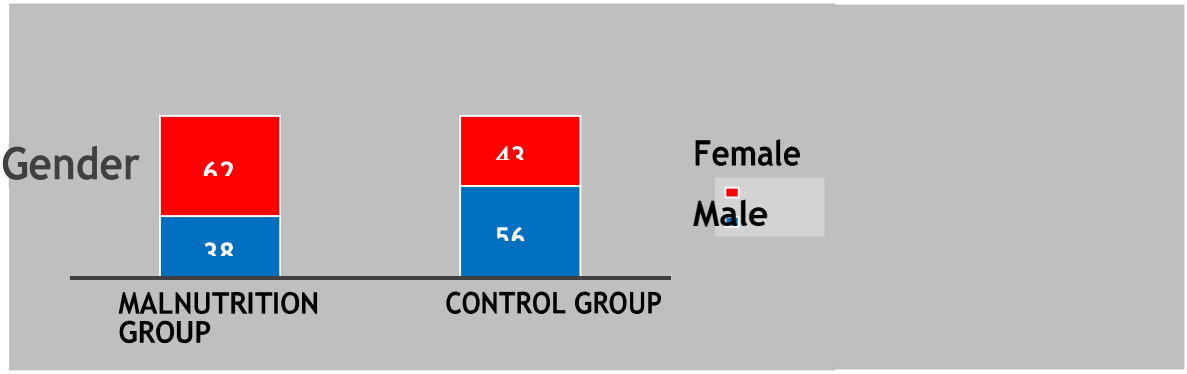

Figure4. 2 : Distribution of Study Groups according to sex

Table 1: Distribution of Study Groups according to Education of Mother and Residence.

Variable	Study Groups		Total (%) n= 110 NO.(%)
	Malnutrition Group n= 50 NO.(%)	Control Group n= 60 NO.(%)	
Educational level of mother			
Illiterate	24 (48.0)	9 (15.0)	33 (30.0)
Primary School	19 (38.0)	17 (28.3)	36 (32.7)
Secondary School	4 (8.0)	24 (40.0)	28 (25.5)
Higher Education	3 (6.0)	10 (16.7)	13 (11.8)
Residence			
Urban	13 (26.0)	38 (63.3)	51 (46.4)
Rural	37 (74.0)	22 (36.7)	59 53.6)

The distribution of study groups by clinical information is shown in table 4.2. In this study, the most common type of feeding in malnutrition and control groups was solid diet (42%, 56.7% respectively); 40% of malnourished patients received food at one year of age while 63.3% of well-nourished children received food at sixth month of age.

Concerning circumcision, the highest proportion of study patients' males was circumcised in malnutrition and control groups (52.6%, 67.6% respectively).

Table 2: Distribution of Study Groups according to Clinical Information

Variable	Study Groups		Total (%) n= 110 NO.(%)
	Malnutrition Group n= 50 NO.(%)	Control Group n= 60 NO.(%)	
Type of Feeding			
Breast	6 (12.0)	12 (20.0)	18 (16.4)
Bottle	16 (32.0)	9 (15.0)	25 (22.7)
Solid	21 (42.0)	34 (56.7)	55 (50.0)
Mixed	7 (14.0)	5 (8.3)	12 (10.9)
Time of introducing food			
No food	17 (34.0)	5 (8.3)	22 (20.0)
At 6th month	6 (12.0)	38 (63.3)	44 (40.0)
At 12th month	20 (40.0)	16 (26.7)	36 (32.7)
At 18th month	7 (14.0)	1 (1.7)	8 (7.3)
Male Circumcision	**n= 19**	**n= 34**	**n= 53**
Yes	10 (52.6)	23 (67.6)	33 (62.3)
No	9 (47.4)	11 (32.4)	20 (37.7)

Regarding the signs and symptoms among study cases, it is noticed that all malnourished patients had pallor (100%), and 88% were wasted as shown in table 4.3.

Table 3: Distribution of Study Cases according to Signs of Malnutrition

Signs of malnutrition	No. (n=50)	Percentage
Pallor	50	100.0
Wasted	44	88.0
Edema	11	22.0
Dehydration	42	84.0
Abdominal distension	10	20.0
Organomegaly	2	4.0
Eye manifestation	7	14.0
Skin manifestation	29	58.0
Hair manifestation	23	46.0

Figure 3 shows the severity of malnutrition according to Waterlow classification; Mild malnutrition was noticed in 44% of patients.

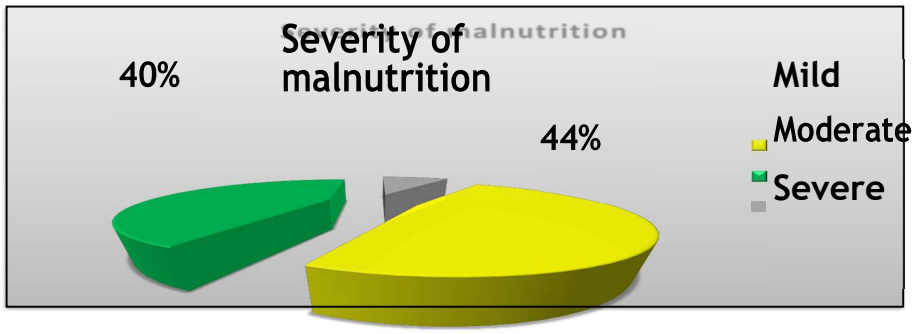

Figure 3 Distribution of Malnutrition Patients by Severity of Malnutrition

In this study, 65.5% of malnourished patients have positive urine culture in comparison to 34.5% of control cases, with a high significant association between urine culture results and malnutrition as shown in Table 4.4.

Table 4 Association between Results of Urine Culture and Study Groups

Urine culture results	Study Groups		Total (%) n=110
	Malnutrition Group (%) n= 50	Control Group (%) n= 60	
Positive	38 (65.5)	20 (34.5)	58 (52.7)
Negative	12 (23.1)	40 (76.9)	52 (47.3)

P- value=0.001 that considered statistically highly significant.

Table 5 Association between Urine Culture Results and Severity of Malnutrition.

Urine culture results	Severity of Malnutrition			Total (%) n= 50 NO.(%)
	Mild (%) n= 22 NO.(%)	Moderate (%) n= 20 NO.(%)	Severe (%) n= 8 NO.(%)	
Positive	17 (44.7)	16 (42.1)	5 (13.2)	38 (76.0)
Negative	5 (41.7)	4 (33.3)	3 (25.0)	12 (24.0)

P-value=0.608
There is no statistical significant association between urine culture results and severity of malnutrition.

Table 6 shows the association between urine culture results and general characteristics in patients with malnutrition. The highest proportion of positive urine culture was seen in patients aged between 2 –3 years (94.1%) with a highly significant association (P= 0.003) between urine culture results and age in patients with malnutrition.

Regarding sex, the highest proportion of positive urine culture was found in females (93.5%) with a significant association (P= 0.001) between urine culture results and sex of patients with malnutrition.

About education of mothers, 91.7% of patients of illiterate mothers had positive urine culture with a high significant association (P= 0.001) between urine culture results and education of mothers in patients with malnutrition.

Regarding residence, the highest proportion of positive urine culture was found in patients living in rural area (91.9%) with a high significant association (P= 0.001) between urine culture results and residence in patients with malnutrition.

Table 6 Association between Urine Culture Results and General Characteristics in Patients with Malnutrition

General characteristics	Urine Culture Results		Total (%) n= 50	P- Value
	Positive (%) n= 38	Negative (%) n= 12		
Age (Years)				
< 2	21 (75.0)	7 (25.0)	28 (56.0)	0.003
2 – 3	16 (94.1)	1 (5.9)	17 (34.0)	
3 – 5	1 (20.0)	4 (80.0)	5 (10.0)	
Sex				
Male	9 (47.4)	10 (52.6)	19 (38.0)	0.001
Female	29 (93.5)	2 (6.5)	31 (62.0)	
Education of mother				
Illiterate	22 (91.7)	2 (8.3)	24 (48.0)	0.001
Primary School	16 (84.2)	3 (15.8)	19 (38.0)	
Secondary School	0 (0)	4 (100.0)	4 (8.0)	
High education	0 (0)	3 (100.0)	3 (6.0)	
Residence				
Urban	4 (30.8)	9 (69.2)	13 (26.0)	0.001
Rural	34 (91.9)	3 (8.1)	37 (74.0)	

Table 7 shows the association between urine culture results and clinical information of patients with malnutrition. The study showed that 93.8% of patients with bottle feeding had positive urine culture with a high significant association (P= 0.002) between urine culture results and type of feeding in patients with malnutrition.

Regarding time of introducing food, 90% of patients who received food at 12th month of age had positive urine culture with a significant association (P= 0.003) between urine culture results and time of introducing food in patients with malnutrition.

About circumcision, the highest proportion of positive urine culture was seen in patients who didn't circumcised (88.9%) with a high significant association (P= 0.001) between urine culture results and circumcision in patients with malnutrition.

Table 7 Association between Urine Culture Results and Clinical Information of patients with malnutrition

Clinical information	Urine Culture Results		Total (%) n= 50	P- Value
	Positive (%) n= 38	Negative (%) n= 12		
Type of Feeding				
Breast	1 (16.7)	5 (83.3)	6 (12.0)	0.002
Bottle	15 (93.8)	1 (6.2)	16 (32.0)	
Solid	16 (76.2)	5 (23.8)	21 (42.0)	
Mixed	6 (85.7)	1 (14.3)	7 (14.0)	
Time of introducing food				
No food	13 (76.5)	4 (23.5)	17 (34.0)	0.003
At 6th month	1 (16.7)	5 (83.3)	6 (12.0)	
At 12th month	18 (90.0)	2 (10.0)	20 (40.0)	
At 18th month	6 (85.7)	1 (14.3)	7 (14.0)	
Male circumcision	**n= 9**	**n= 10**	**n= 19**	
Yes	1 (10.0)	9 (90.0)	10 (52.6)	0.001
No	8 (88.9)	1 (11.1)	9 (47.4)	

Table 8 shows the association between malnutrition and general characteristics in patients with positive urine culture. The highest proportion of malnutrition was seen in females (78.4%) with a high significant association (P= 0.010) between malnutrition and sex of patients with positive urine culture.

About education of mothers, the highest proportion of malnutrition was seen among illiterate patients' mothers (78.6%) with a high significant association (P= 0.001) between malnutrition and education of mothers in patients with positive urine culture.

Regarding residence, the highest proportion of malnutrition was found in patients living in rural area (73.9%) with a significant association (P= 0.015) between malnutrition and residence.

Table 8 Association between Malnutrition and General Characteristics in Patients with Positive Urine Culture.

General characteristics	Study Groups		Total (%) n= 58	P- Value
	Malnutrition Group (%) n= 38	Control Group (%) n= 20		
Age (Years)				
< 2	21 (67.7)	10 (32.3)	31 (53.4)	0.483
2 - 3	16 (66.7)	8 (33.3)	24 (41.4)	
3 - 5	1 (33.3)	2 (66.7)	3 (5.2)	
Sex				
Male	9 (42.9)	12 (57.1)	21 36.2)	0.01
Female	29 (78.4)	8 (21.6)	37 (63.8)	
Education of mother				
Illiterate	22 (78.6)	6 (21.4)	28 (48.3)	0.001
Primary School	16 (72.7)	6 (27.3)	22 (37.9)	
Secondary School	0 (0)	6 (100.0)	6 (10.3)	
High education	0 (0)	2 (100.0)	2 (3.5)	
Residence				
Urban	4 (33.3)	8 (66.7)	12 (20.7)	0.015
Rural	34 (73.9)	12 (26.1)	46 (79.3)	

Table 9 shows the association between malnutrition and clinical information in patients with positive urine culture. It was noticed that 85.7% of patients who received food at 18th month of age were complaining from malnutrition with a high significant association (P= 0.001) between malnutrition and time of introducing food. There was no significant association (P ≥ 0.05) between malnutrition and other clinical information in patients with positive urine culture

Table 9 Association between Malnutrition and Clinical Information in Patients with Positive Urine Culture.

Clinical information	Study Groups		Total (%) n= 58 NO.(%)	P-Value NO.(%)
	Malnutrition Group (%) n= 38 **NO.(%)**	Control Group (%) n= 20 **NO.(%)**		
Type of Feeding				
Breast	1 (50.0)	1 (50.0)	2 (3.4)	0.646
Bottle	15 (65.2)	8 (34.8)	23 (39.7)	
Solid	16 (61.5)	10 (38.5)	26 (44.8)	
Mixed	6 (85.7)	1 (14.3)	7 (12.1)	
Time of introducing food				
No food	13 (81.3)	3 (18.7)	16 (27.6)	0.001
At 6th month	1 (10.0)	9 (90.0)	10 (17.2)	
At 12th month	18 (72.0)	7 (28.0)	25 (43.1)	
At 18th month	6 (85.7)	1 (14.3)	7 (12.1)	
Male circumcision	**n= 9**	**n= 12**	**n= 21**	
Yes	1 (25.0)	3 (75.0)	4 (19.0)	0.603
No	8 (47.1)	9 (52.9)	17 (81.0)	

Table 10 shows the distribution of study patients by urine culture results. The most common microorganism in malnutrition group was *E. coli* (34%) while in control groups, 66.7% of samples were negative .

Table 10 Distribution of Micro-organism in Positive Cases among Study Groups.

Urine culture result	Study Groups		Total (%) n= 110
	Malnutrition Group n= 50	Control Group n= 60	
Negative	12 (24.0)	40 (66.7)	52 (47.3)
E.coli	17 (34.0)	17 (28.3)	34 (30.9)
Proteus	8 (16.0)	2 (3.3)	10 (9.1)
Klebsiella	6 (4.0)	1 (1.7)	7 (6.4)
Pseudomonas	3 (22.0)	0 (0)	3 (2.7)
Staph aureus	4 (8.0)	0 (0)	4 (3.6)

Regarding ultra sound (US) findings, cystitis was noticed in 48% of malnutrition group while normal report was noticed in 68.3% of control groups as shown in Table 11.

Table 11 : Ultrasound Finding among Study Groups.

U/S	Study Groups		
	Malnutrition Group n= 50	Control Group n= 60	Total (%) n= 110
Normal	18 (36.0)	41 (68.3)	59 (53.6)
Cystitis	24 (48.0)	15 (25.0)	39 (35.5)
Hydronephrosis	2 (4.0)	3 (5.0)	5 (4.5)
Pelvicalyceal system dilatation (PCSD)	6 (12.0)	1 (1.7)	7 (6.4)

Discussion

Pallor was the most sign noticed in this study cases that present in all cases, which is due to several elements deficiencies like iron, folate, B12, zinc, copper and vitamin C. Wasting was the second sign noticed in this study, which is

due to loss of muscle bulk especially in those with marasmus and kwashiorkor cases.

The result of this study showed that 65.5% of malnourished cases have positive culture in comparison to 34.5% of control cases, which considered statistically highly significant.

The ASB in malnourished cases were detected in other areas of world like Turkey by Caksen H. *et al*. (12.3%). [9]

This difference in the result could be explained by using different methods in collecting urine sample including midstream urine sample in children who can control urination and urine bag or suprapubic aspiration in younger children that can not control urination. Using urine bag resulting in high false positive result (that explain why ASB common in children younger than 3 years) while suprapubic aspiration (that used in Turkey and India) considered more accurate and associated with uncontaminated urine. This may be due to that infection can occur even in mild form of malnutrition or may be due to small sample study.

In this study the relation between ASB and degree of malnutrition was not significant and the incidence of ASB not increased by severity of malnutrition, this goes with Müller *et al*.[10]

Regarding to sex, the incidence of ASB was more common in females in both well and malnourished cases, this may be due to short urethra in female, so bacteria can reach the bladder more easily, also close proximity of urethral meatus to anus causing easily contamination by faecal materials. Majority of malnourished female cases had positive urine culture so there was significant association between sex and incidence of ASB. This is going with Ajeet S *et al*.[11]

The result of this study showed that most malnourished cases were under 2 years, that may be due to many factors including poor

weaning, feeding principles and low rate exclusive breast fed, that goes with Ansuya in Karnataka. [12] In previous studies in Nigeria, an estimated 64% of cases admitted as malnutrition were less than 2 years.[14] The incidence of ASB increased in children less than 3 years of age in both well and malnourished cases, In malnourished cases there was significant association between age and incidence of ASB, so the highest proportion of ASB seen in patients under 3 years, the cause may be due to difficulty in using toilet under this age so using urine bag may give high false positive result comparing with using suprapubic aspiration or urethral catherization. The collection of sterile urine specimens (using suprapubic aspiration or urethral catheterization) is too invasive to patient and costly to be considered for detection of asymptomatic cases, that goes with Uche Okafor and Tagbo .[14]

The highest proportion of ASB was found in patients living in rural area in both well and malnourished cases, with a highly significant association between malnutrition in rural children with the positive urine culture, this due to poor health consciousness, low socioeconomic state and bad hygiene in rural areas, that goes with Elo-Ilo *et al*.[8]

This study showed high incidence of ASB in non-circumcised children in both well and malnourished cases, with highly significant association between non-circumcision and malnutrition with the positive urine culture. It is known that there is bacterial colonization of the foreskin that may be an important risk factor for the development of UTI, this goes with Michael *et al* study who showed an 11-fold increased UTI rate among uncircumcised boys compared to circumcised boys.[15]

Distribution of microorganism in this study showed that the *E.coli* was the most common

microorganisms isolated in both well-nourished and malnourished cases, the cause may be due to colonization of *E.coli* in urinary passage in malnourished cases due to high rate of gastroenteritis in those patients and could be due to back to front washing and faecal contamination especially in female. This study goes with Justyna *et al*. (16)

The most common US finding in this study was cystitis, cystitis can occur in children who are otherwise healthy and have no medical problems. Irritants such as bubble baths, poor toilet or hygiene habits and an abnormality in the structure or function of the urinary tract all can cause a bladder infection, this goes with Korbel *et al* and Brian *et al*.(17)

Conclusion : The study concluded that: The incidence of ASB significantly increased in malnourished cases (38 out of 50 patients) (65.5%) but not related to degree of severity of malnutrition.

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