RESULTS AND ANALYSIS OF DATA

* This work included 30 cases; 20 cases with kwashiorkor and 10 control cases .

* The 10 control cases are well nourshed children 5 males and 5 females with age from 6 months to 2 years with mean of 14.6 months.

- All measurements of control cases were with in normal ranges.

Hb%, serum protein and albumin were with in normal ranges Aflatoxins could not be detected in any of their urine or blood samples.

* Clinical data of kwashiorkor cases are listed in the table [2,3,4,5,6,7,8,9,10,11].

Sex:

Eleven of them were male (55%)

Nine of them were female (45%)

Age:

Range from 8.5 months to 24 months with mean 15.5 months $\pm$ 4.76

Ecological Data:

- All of them were from rural areas 100%.

Nine of them were with illiterate father and mother [45%].

Seven of them were with illiterate mother only [35%].

Four of them were with educated father and mother [20%].

Fathers age range from 22y to 49 y with mean 34.5 Y. ± 9.27

Mothers age range from 17 y to 40 y with mean 25.5 Y. ± 7.

All of them had father with manual work [100%]

and mother house wife [100%].

All of them had low income family [100%].

Water Supply:

13 of them had piped water supply [65%]

five " " " well " " [25%]

two " " " canal " " [10%]

The method of cooking were

Kerosene in eight cases [40%]

Open fire in three cases [15%]

bottled gas in nine cases [45%]

Dietary History:

Four of them were completely breast milk fed (20%)

Sex of them were partially breast milk fed (30%)

eight of them were animal milk fed (40%)

All of them received starchy foods (100%)

Eight of them received some protein foods (40%)

Birth Order

three of them were 1st child (15%)

three of them were 2nd child (15%)

five of them were 3rd child (25%)

five of them were 4th child (25%)

two of them were 5th child (10%)

one of them were 6th child (5%)

one of them were 7th child (5%)

Examination

Seven of them with gastroenteritis (35%)

Four of them with chest infection (20%)

Sex of them with paler (30%)

13 of them with hair changes (65%)

Seven of them with skin changes (35%)

All of them with mental changes (100%)

All of them were in patient (100%)

seven of them with face oedema (35%)

All of them with L.Limb oedema (100%)

All of them with hepatomegaly (100%)

Anthropometric measurment:

* Their weight range from 5.300 kg to 9kg

with mean weight 7.12 kg ± 0.95

which is below the fifth percentile for their age.

* Their length range from 59 cm to 70cm

with mean length 63.7cm ± 3.57

which is below the fifth per centile for their age .

* Their skull circumference range from 41cm to 47cm with mean 43.9cm ± 1.52.

* Their arm circumference rang from 9cm to 11.5cm with mean 10.3 ± 0.91

*Their chest circumference rang from 40 to 48cm with mean 42.3± 2

Laboratory Investigations:

*Their serum protein were range from 3.2 to 6.7 gm/100ml with mean 5 gm/100ml

± 0.87 which is lower than normal rang [6-8gm/100ml]

* Their serum albumin were range from 1.2 to 2.8 gm/100ml with mean 1.99gm

/100ml ± 0.4 which is lower than the normal range [3.5-5 gm%].

The mean Hb% was 8.8gm% ± 1.2 range between 7 and 10.7gm% which was lower than the normal range 11-14gm%

Aflatoxins Levels:

- Aflatoxins were present in blood of 6 cases out of 20 cases (cases n. 2-6- 10-13-17-19) which is 30%

with concentration range from 0.1 to 4.5 ng/ml with mean of 2.03 ng/ml which is significant different from control cases,

5 out of the 6 +ve cases had main aflatoxin B_1 (case n 2-10-13-17-19) with concentration range from 0.7 to 4.5 with mean 2-28 ng/ml.

2 cases (no. 6-17) had aflatoxin M_1.

with concentration range from 0.1 to 0.5 ng/ml with mean 0.3ng/ml

one case n 6 had aflatoxin M_2 with concentration 0.2ng/ml.

Notice

case n .6 contain both M_1 0.5 ng/ml + M_2 0.2 ng/ml

case n. 17 contain both B_1 2.3 ng/ml + M_1 0.1ng/ml

- Aflatoxins were detected in the urine samples of 8 out of 20 cases [case n. 2-7-9-11-13-14-17-20] with percent (40%)

with concentration rang from 0.7 to 2.5 ng/ml with mean of 1.27 ng/ml which is

highly sig. different from control cases

2 cases (n 11-20) were +ve for AFB_1 [1.5 ng/ml- 0.7 ng/ml]

One case (n 7) was + ve for AFG_1 with concentration 1.1 ng/ml

3 cases (n. 2-13-14) had AFM_1 with concentration (1.8 - 0.9 - 2.5 ng/ml)

2 cases had AFRo with concentration (0.8-09 ng/ml) (n 9-17)

– So 14 samples were+ ve for aflatoxins and /or their metabolites either in bl. or urine out of 20 patient

and 11 cases were +ve for aflatoxins and /or theirmetabolites either in bl. or urine out of 20 patient with kwashiorkor (55%).

Table (2): Clinical and nutritional data of kwashiorkor group.

Case No.	AGE MONTH	SEX		BIRTH ORDER	BREAST MILK		FORM. MILK	ANIMAL MILK	OTHER FOODS	
		MALE	FEMALE		PARTIA.	EXCLUSIV.			STARCHY	PROTEIN
1	8.5	+ ve		6th		+ ve			+ ve	
2	18		+ ve	2nd				+ ve	+ ve	+ ve
3	12		+ ve	2nd	+ ve			+ ve	+ ve	
4	18		+ ve	3rd				+ ve	+ ve	+ ve
5	16	+ ve		2nd					+ ve	
6	12		+ ve	3rd	+ ve			+ ve	+ ve	
7	18	+ ve		5th				+ ve	+ ve	
8	18		+ ve	7th				+ ve	+ ve	
9	18		+ ve	4th	+ ve				+ ve	+ ve
10	24	+ ve		1st					+ ve	+ ve
11	18	+ ve		3rd					+ ve	+ ve
12	18		+ ve	4th	+ ve				+ ve	
13	13	+ ve		4th				+ ve	+ ve	
14	9	+ ve		4th		+ ve			+ ve	
15	17	+ ve		5th					+ ve	
16	11	+ ve		1st		+ ve			+ ve	+ ve
17	18		+ ve	3rd	+ ve			+ ve	+ ve	
18	22	+ ve		3rd	+ ve				+ ve	
19	24	+ ve		1st		+ ve			+ ve	+ ve
20	14		+ ve	4th					+ ve	+ ve
No. of the+ve		11	9		6	4	0	8	20	8
% of + ve		55%	45%		30%	20%	0%	40%	100%	40%

Form. = Formula. Partia. = Partially. Exclusiv. = Exclusively.

Table (3): data of kwashiorkor parents.

Case No.	FATHER'S DATA					MOTHER'S DATA				
	AGE year	ILLIT.	EDUCAT.	MANUAL work	CLERK	AGE	ILLIT.	EDUCAT.	WORKING	HOUSE W.
1	38		+ ve	+ ve		38	+ ve			+ ve
2	22	+ ve		+ ve		17	+ ve			+ ve
3	29		+ ve	+ ve		25	+ ve			+ ve
4	27		+ ve	+ ve		21		+ ve		+ ve
5	27	+ ve		+ ve		19	+ ve			+ ve
6	35		+ ve	+ ve		23		+ ve		+ ve
7	32		+ ve	+ ve		22	+ ve			+ ve
8	50	+ ve		+ ve		40	+ ve			+ ve
9	40		+ ve	+ ve		30		+ ve		+ ve
10	23		+ ve	+ ve		19	+ ve			+ ve
11	29	+ ve		+ ve		18	+ ve			+ ve
12	25	+ ve		+ ve		20	+ ve			+ ve
13	49		+ ve	+ ve		37	+ ve			+ ve
14	43	+ ve		+ ve		32	+ ve			+ ve
15	49		+ ve	+ ve		38	+ ve			+ ve
16	30		+ ve	+ ve		18	+ ve			+ ve
17	38	+ ve		+ ve		25	+ ve			+ ve
18	48	+ ve		+ ve		27	+ ve			+ ve
19	27		+ ve	+ ve		25		+ ve		+ ve
20	29	+ ve		+ ve		23	+ ve			+ ve
No. of the + ve		9	11	20	0		16	4	0	20
% of + ve		45%	55%	100%	0%		80%	20%	0%	100%

Illit = Illiterate. Educat = Educated. House w. = House wife.

Table (4): Ecological data of kwashiorkor group.

Case No.	FAMILY INCOME			WATER SUPPLY			METHOD OF COOKING		
	LOW	MEDIUM	HIGH	PIPED	WELL	CANAL	OPEN F.	KEROSENE	BOTTLED GAS
1	+ ve			+ ve				+ ve	
2	+ ve			+ ve				+ ve	
3	+ ve			+ ve					+ ve
4	+ ve				+ ve			+ ve	
5	+ ve				+ ve				+ ve
6	+ ve			+ ve					+ ve
7	+ ve			+ ve			+ ve		
8	+ ve				+ ve			+ ve	
9	+ ve			+ ve					+ ve
10	+ ve			+ ve					+ ve
11	+ ve			+ ve					+ ve
12	+ ve				+ ve			+ ve	
13	+ ve					+ ve			+ ve
14	+ ve			+ ve			+ ve		
15	+ ve			+ ve					+ ve
16	+ ve			+ ve					+ ve
17	+ ve					+ ve		+ ve	
18	+ ve			+ ve				+ ve	
19	+ ve			+ ve				+ ve	
20	+ ve				+ ve		+ ve		
No. of the+ve	20	0	0	13	5	2	3	8	9
% of + ve	100%			65%	25%	10%	15%	40%	45%

Open F. = Open Fire.

Table (5): Clinical data of kwashiorkor group.

Case No.	APPEARANCE			HAIR CHANGES	SKIN CHANGES	MENTAL CHANGES	ODEMA		HEPATO-MEGALY	ASSOCIATED DISEASES		
	JUNDICE	PALLOR	CYANOSIS				FACE	LOWER L		G.E.	CHE.INF	OTHERS
1				+ ve		+ ve		+ ve	+ ve			
2						+ ve		+ ve	+ ve	+ ve		
3				+ ve	+ ve	+ ve	+ ve	+ ve	+ ve	+ ve		
4		+ ve		+ ve	+ ve	+ ve		+ ve	+ ve	+ ve	+ ve	
5						+ ve		+ ve	+ ve	+ ve		
6				+ ve		+ ve	+ ve	+ ve	+ ve			
7					+ ve	+ ve	+ ve	+ ve	+ ve			
8		+ ve		+ ve		+ ve		+ ve	+ ve		+ ve	
9				+ ve		+ ve	+ ve	+ ve	+ ve			
10				+ ve	+ ve	+ ve		+ ve	+ ve			
11		+ ve				+ ve		+ ve	+ ve			
12		+ ve		+ ve		+ ve	+ ve	+ ve	+ ve			
13						+ ve		+ ve	+ ve	+ ve		
14				+ ve	+ ve	+ ve		+ ve	+ ve	+ ve	+ ve	
15				+ ve		+ ve	+ ve	+ ve	+ ve			
16						+ ve		+ ve	+ ve			
17		+ ve		+ ve		+ ve		+ ve	+ ve		+ ve	
18				+ ve		+ ve		+ ve	+ ve			
19					+ ve	+ ve		+ ve	+ ve			
20		+ ve		+ ve	+ ve	+ ve	+ ve	+ ve	+ ve	+ ve		
No. of the+ve		6		13	7	20	7	20	20	7	4	
% of + ve		30%		65%	35%	100%	35%	100%	100%	35%	20%	

G.E. = Gastroenteritis. Che.inf = Chest infection. Lower L.= Lower limb.

Table (6): Anthropometric Measurements of Kwashiorkor Group.

Case No.	AGE MONTH	WEIGHT Kg	% W/A	LENGTH cm	% L/A	SKULL CIRC.	% S.C/A	ARM CIRCUMFR.	CHEST CIRCUMFR.
1	8.5	5.300	65%	60	84%	41.5	93%	9	40
2	18	7	61%	63	77%	44	91.6%	11	42
3	12	6.800	64%	59	78%	44	93%	9.5	41
4	18	7.800	68%	65	88%	45	94%	10	45
5	16	7.500	75%	64	81%	44	92%	12	41
6	12	7	68%	60	80%	43	91%	9	41
7	18	7.200	63%	66	81%	46	96%	10.5	42
8	18	7.300	63%	64	79%	44	91%	11.5	43
9	10	6.500	76%	60	82%	41	89%	10	44
10	24	9	69%	68	78%	45	92%	11	48
11	18	8	69%	70	86%	47	98%	11	43
12	18	7.500	65%	66	81%	46	96%	11.5	43
13	13	8	76%	62	82%	45	95%	9.5	41
14	9	6	65%	59	82%	42	92%	9	40
15	17	6.500	61%	64	80%	44	91%	10	42
16	11	6	68%	61	82%	43	91%	9	41
17	10	5.900	71%	61	83%	43	93%	10	40
18	22	8	72%	69	81%	44	89%	11	44
19	24	8.600	71%	70	80%	45	92%	11	44
20	14	6.500	68%	63	82%	43	91%	10.5	41
Mean	15.52	7.120	67.9%	63.7	80.9	43.9	92.5	10.3	42.3
S.D.	4.76	0.9578	4.6	3.57	2.1	1.525	2.314	0.9101	2

% W/A = Weight to average weight for their age. % L/A.= Length to average length for their age.

% S.C/A.= skull circumfrance to average skull circumfrance for their age. Circ. = Circumfrance.

Table (7): Important laboratory findings in kwashiorkor group.

CASE No.	SERUM PROTEIN		Hb%
	TOTAL	ALbumun	
1	6	2.5	10.7%
2	5.8	1.9	9%
3	4.2	2.2	10%
4	4.7	2	7%
5	6.3	2	9.5%
6	4.5	1.5	9%
7	5.5	1.4	9.1%
8	5	2.5	8.2%
9	4.8	1.8	9.8%
10	4.5	2	6.9%
11	5.8	2.2	6.7%
12	3.2	1.2	7.7%
13	6.7	2.8	9.3%
14	4.3	2.5	10%
15	5.2	1.7	9%
16	5.	1.9	10.5%
17	4.6	1.8	8%
18	4.5	2.1	9.2%
19	6	2.2	9.5%
20	4	1.6	7.8%
MEAN	5.03	1.99	8.848
S.D.	0.874	0.405	1.184

Table (8): Aflat oxin in blood samples (ng/ml) of kwashiorkor children.

CASE No.	Blood AFLATOXINS (ng/ml)								
	B1	B2	G1	G2	M1	M2	B2a	Q	Ro
1									
2	2.4								
3									
4									
5									
6					0.5	0.2			
7									
8									
9									
10	0.7								
11									
12									
13	1.5								
14									
15									
16									
17	2.3				0.1				
18									
19	4.5								
20									

major aflatoxins, B_1, B_2, G_1, G_2

Aflatoxins metabolites M_1, M_2, B_{2a}, Q and R_o

Table (9): Aflat oxin in urine samples (ng/ml) of kwashiorkor children.

CASE No.	URINE AFLATOXINS (ng/ml)								
	B1	B2	G1	G2	M1	M2	B2a	Q	Ro
1									
2					1.8				
3									
4									
5									
6									
7			1.1						
8									
9									0.8
10									
11	1.5								
12									
13					0.9				
14					2.5				
15									
16									
17									0.9
18									
19									
20	0.7								

Table (10): Aflatoxin in blood and urine samples (ng/ml) of kwashiorkor children.

CASE No.	AFLATOXIN IN BLOOD			AFLATOXIN IN URINE			
	B1	M1	M2	B1	G1	M1	RO
2	2.4					1.8	
6		0.5	0.2				
7					1.1		
9							0.8
10	0.7						
11				1.5			
13	1.5					0.9	
14						2.5	
17	2.3	0.1					0.9
19	4.5						
20				0.7			

Table (11): Aflatoxin in blood and urine samples (ng/ml) of kwashiorkor and control children.

	Kwashiorkor	control	(t)	P.	Sig.
AFLATOXINS IN BLOOD					
No. of total cases	20	10			
No. of postive cases	6	0			
Percentages of postive cases	30	0			
Mean ± S.D.	2.03 ± 1.42		3.48	< 0.05	S.
AFLATOXIN IN URINE					
No. of total cases	20	10			
No.of postive cases	8	0			
Percentages of postive cases	40%	0			
Mean ± S.D	1.275 ±0.62		5.812	<0.001	h.s

(t) = test of significance

P. = probability

S. = significant

h.s. = highly significant

S.D. = Standard deviation

Table (12) : Anthropometric measurements and laboratory Findings in Kwashiorkor and control children .

		Kwashiorkor	control
Age month	Mean ± S . D	15 . 52 ± 4 . 76	14 . 6 ± 3 . 55
Weight Kg .	Mean ± S . D	7 . 12 ± 0 . 958	9 . 55 ± 1 . 134
length cm.	Mean ± S . D	63 . 7 ± 3 . 57	70 . 86 ± 5. 26
Skull circ . cm.	Mean ± S . D	43 . 9 ± 1 . 525	46 . 71 ± 3. 91
Arm circ. cm.	Mean ± S . D	10 . 3 ± 0 . 91	11 . 5 ± 1 . 22
Chest circ . cm.	Mean ± S . D	42 . 3 ± 2	44 ± 2 . 73
Total Serum protein gm/100 ml	Mean ± S . D	5 . 03 ± 0 . 874	6 . 8 ± 0 . 93
Serum Albumin gm/100 ml	Mean ± S . D	1 . 99 ± 0 . 405	4 . 2 ± 0 . 78
Hb % gm%	Mean ± S . D	8 . 848 ± 1 . 184	12. 5 ± 1 . 89