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Health Profile of Bedouin Children Living at South Sinai

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South Sinai is an arid governorate at the northern east part of Egypt. Inhabitant of this area have unique pattern of life due to ecological, social and cultural conditions. Evaluations of children health status could be the base for further development of this community. Cross sectional study survey was designed; four sites were randomly selected to study health status of children. Sites were distributed according to social activities and ecological differences. Four hundred and nine children were examined, age ranged from 5-17 years. At their living sites, a questionnaire for every child was fulfilled about health problems and anthropometric measurements were collected. Urine and stool samples were analyzed. Xylose test was performed to assess intestinal integrity for 51 children. 9.1 and 13.6% were stunted and wasted, respectively. Clinical examination declared high prevalence of skin diseases (12.7%) high rate of urinary tract infection, pus cells (>5-50/ HPF), were present in 59.3% of children, where clumps (>50/ HPF) were present in 6.2%. Crystals of urate and oxalates were present in 83.2 and 30.1%, respectively. Only 11.8% of the studied children had normal xylose excretion. Stool analysis showed that 28.31% had intestinal protozoal infestations and 9.43% suffered of helminthes infestation. We concluded that wasting and stunting are high. Nutritional defect due to insufficient supply or/and unhealthy nutritional habits together with increased incidence of malabsorption, protozoal and parasitic infestation could be the explanation. Urinary tract infections and crystals were abundant. Many of these health problems should be prevented.

Key words: Sinai, bedouin, stunting, nutrition, urine, malabsorption

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INTRODUCTION

South Sinai is an arid governorate at the north east corner of Egypt with internationally recognized coasts, coral reefs and many protected desert landscapes (EEAA, 2004).

Inhabitants of Sinai have unique pattern of life which is far different from that of other Egyptian urban or even rural communities. Population is only 2/square km of total area. Dry weather, low income, limited dietary resources, lack of water supply, illiteracy and inadequate health services have their effect on health status of the population (Fahim *et al*., 1991; Abdel Kader, 2005).

Malnutrition was found to be prevalent among Bedouin children in different localities. They showed high incidence of stunting and wasting (Shubair *et al*., 2000; Baba *et al*., 1994; Sebai, 1987). The Bedouin of the southern Sinai showed also evidence of stunted growth (Beverly and Henderson, 2003; Yamamah, 1998). Evaluations of children health status could be the base for further development of this community. To our knowledge there was no comprehensive health study for children in south Sinai till the moment.

Aim of the study evaluation of health profile and major health problems with determination of growth patterns of children living at different localities in south Sinai.

MATERIALS AND METHODS

Four sites representing different ecological conditions and main population activities were selected as shown in Table 1. Family income in areas with tourism activity is much higher than that with Grazing alone. Two visits were conducted during April and October 2004 to the study sites. Four hundred and nine children aging 5-17 years were randomly selected and visited at their living sites in the desert. They represent 5% of all children within the same age group inhabiting South Sinai (Abdel Kader, 2005). Parents were informed about the study and consent was obtained from each parent or care taker. Every child was subjected to the following:

- History talking including birth date or age and major or chronic health problems.
- Through clinical examination.
- Anthropometric measuring under standard conditions including weight (Jellife *et al*., 1989), height and Body Mass Index (BMI) calculation (Hammer *et al*., 1991) and triceps skin fold thickness.
- Weight-for-height Z score (WAZ), weight-for-age-percentile (WAP), height-for-age Z score (HAZ) and height-for-age percentile (HAP) were calculated using Anthro-software program.

Table 1: Study sites and main population activities

Study site	Location	Main activity
Dahab (D)	East	Fishing, Tourism
St. Katherine (K)	Center	Grazing, Tourism
Sharm El-Sheikh (S)	South	Tourism
El-Tor (T)	West	Grazing

- Routine urine and stool analysis and stool examination for parasites
- **Xylose excretion testing:** Xylose excretion test as a simple indicator for gastrointestinal absorptive capacity (Kraut *et al*., 1980), for 51 children from St.Kathrene and Sharm El Sheikh areas using standard technique used by Roe and Rice (1970).

Statistical analysis: Statistical package SPSS version 9.0 was used for statistical analysis. Data were represented as frequency, percent and mean±standard deviation.

One-way analysis of variance followed by post-hoc comparisons procedures were used to compare between 3 or more independent means. Chi-Square test was used to compare between independent proportions. A p-value of less than 0.05 was considered statistically significant.

RESULTS

Descriptive data of the study groups are shown in Table 2. Table 3 shows increased incidence of wasting and stunting in all the studied sites. 20.82% in all children were below the 5th weight-for age percentile, while, 13.13% were below the 5th height-for age percentile. The highest incidence of wasting and stunting were in E-Tour (T), 22.7 and 19.7%, respectively. However, there was no statistically significant difference between individual percentages of the 4 studied sites. Also mean of height-for-age Z score was statistically significantly lower ($p<0.05$) in El-Tour compared to Dahab (D) and Sharm El-Sheikh (S) and St. Katharine (K) compared to Sharm El-Sheikh (S) (Table 2).

Table 4 shows general decrease in the triceps skin-fold in whole sample compared to reference values (Tanner and Whitehouse, 1975), individually this was seen in St. Katharine (K), Sharm El-Sheikh (S) and El-Tor (T).

Skin diseases show high incidence in the study groups and they were significantly statistically higher ($p<0.05$) in males compared to females (Table 5).

Table 6 shows xylose excretion test in a randomized sample in St-Katharine (K) and Sharm El-Sheikh (S) areas, the results were below normal in 88% in the whole sample, indicating a marked increase of intestinal malabsorption. However there was no statistically significant difference between the 2 areas.

Table 2: Anthropometric data of the study groups

Sex No.	D No. = 73	K No. = 100	S No. = 87	T No. = 149	Total No. = 409
Male	34	62	40	82	218
Female	39	38	47	67	191
Age (years)					
Mean±SD	11.04±3.29	11.26±2.86	8.57±1.49	9.91±3.92	10.15±3.31
Weight (kg)					
Mean±SD	34.97±12.3	33.07±9.13	25.15±5.44	30.14±10.43	30.62±10.49
Height (cm)					
Mean±SD	149.43±9.77	145.19±12.04	130.77±10.0	136.35±17.83	139.06±15.46
Mid-arm circumference (cm)					
Mean±SD	20.70±3.15	19.00±2.86	17.71±1.62	18.58±3.07	18.87±2.88
Tricepes skin fold thickness (cm)					
Mean±SD	10.96±4.97	7.15±3.95	6.51±3.13	7.40±3.88	7.67±4.16
HAZ*					
Mean±SD	-0.11±1.20	-0.54±0.96	-0.06±1.25	-0.65±1.17	-0.39±1.19
WAZ					
Mean±SD	-0.38±2.06	-0.98±0.96	-0.76±0.88	-0.91±1.03	-0.77±1.32
% of the total	17.80	24.40	21.30	36.40	100.00

No. = No. of examined children. Data presented as mean and standard deviation score *: In the form statistically significant difference ($p<0.05$) between El-Tour compared to Dahab (D) and Sharm El-Sheikh (S) and St. Katharine (K) compared to Sharm El-Sheikh (S). Weight-for-height Z score (WAZ), weight-for-age-percentile (WAP), height-for-age Z score (HAZ) and height-for-age percentile (HAP)

Table 3: WAP and HAP of the study group in different sites

Parameters	D	K	S	T	Total	p-value
WAP						
<5th						
No.	13.0	13.0	13.0	27.0	66.00	0.736
(%)	17.8	24.1	18.3	22.7	20.82	
≥ = 5th						
No.	60.0	41.0	58.0	92.0	251.00	
(%)	82.8	75.9	81.7	77.3	79.18	
Total						
No.	73.0	54.0	71.0	119.0	317.00	
HAP						
<5th						
No.	5.0	4.0	7.0	23.0	39.00	0.062
(%)	8.6	7.8	9.9	19.7	13.13	
≥ = 5th						
No.	53.0	47.0	64.0	94.0	258.00	
(%)	91.4	92.2	90.1	80.3	86.87	
Total						
No.	58.0	51.0	71.0	117.0	297.00	

Weight-for-age-percentile (WAP), height-for-age Z score (HAZ) and height-for-age percentile (HAP). <5th =less than 5th percentile. ≥5th = equal or more than 5th percentile. P = Significance between different sites. Dahab (D) and Sharm El-Sheikh (S) and St. Katharine (K) Sharm El-Sheikh (S)

Table 4: Triceps skin fold of the study groups

Parameters	D	K	S	T	Total
Mean age (years)	11.04	11.26	8.75	9.91	10.15
Triceps skin fold (mm)					
Mean	10.69	7.15	6.51	7.40	7.67
Reference value*	10.60	10.60	9.50	10.10	10.30

*: Tanner and Whitehouse (1975); Dahab (D) and Sharm El-Sheikh (S) and St. Katharine (K) Sharm El-Sheikh (S)

Table 5: Clinical data of the study group

	Males No. = 218		Females No. = 191			Total No. = 409	
Disease	No.	(%)	No.	(%)	p-value	No.	(%)
Asthma	4	1.83	0	0.0	0.079	4	0.98
Cardiac valve lesion	1	0.46	5	2.62	0.08	6	1.47
Abdominal organomegaly	3	1.38	4	2.09	0.428	7	1.71
Neurological disease (Myopathy, MR)	1	0.46	5	2.62	0.0799	6	1.47
Skin disease (eczyma and or dry scaly skin)	36	16.51	16	8.38	0.014	52	12.71
Total	45	20.46	30	15.71		75	18.34

MR = Mental Retardation

Table 6: Xylose excretion in the 2 sites

		Xylose excretion				
		<Normal		Normal		
Site	No.	No.	(%)	No.	(%)	p-value
K	25	22	88.0	3	12.0	
S	26	23	88.5	3	11.5	0.647
Total	51	45	88.2	6	11.8	

<Normal = Less than normal, St. Katharine (K), Sharm El-Sheikh (S)

Table 7 shows urine analysis in a randomized sample in El-Tour (T) and St-Katharine (K) areas, there was high incidence of urinary tract infection indicated with increased RBCs, >5/HPF, to 35.49% and increased pus cells, >5/HPF, to 59.29% in the whole sample. There was also evidence of increased incidence of crystalurea, which may be related to the water supply, dietetic habits and or to hereditary predisposition. This carries a potential risk of increased incidence of

Table 7: Urine analysis of the study group

Parameters	p-value	K (No. = 38) No.	(%)	T (No. = 75) No.	(%)	Total (No. = 113) No.	(%)
RBCs (/HPF)							
>5-20	NS	11	28.95	24	38.67	40	35.49
>20	NS	2	5.26	6	8.00	8	7.08
Pus cells (/HPF)							
>5-50	NS	25	65.79	42	56.00	67	59.29
Clumps (>50)	NS	2	5.26	5	6.67	7	6.19
Crystals (≥ ++)							
Urates	NS	35	92.11	59	78.67	94	83.19
Oxalates	NS	10	26.32	24	32.00	34	30.09
Triple phosphate	NS	1	2.63	0	0.00	1	0.88
Both urates and oxalates	NS	8	21.05	13	17.33	21	18.58

NS = Not Significant, St. Katharine (K) El- Tour (T), (≥ ++) = More than or equal 2 pluses

Table 8: Stool analysis of the studied group

Parameters	K (No. = 16) No.	(%)	T (No. = 37) No.	(%)	p-value	Total (No. = 53) No.	(%)
RBCs (≥+)	3	18.75	11	29.73	NS	14	26.42
Pus cells (≥+)	6	37.50	20	54.05	NS	26	49.06
Starch (≥+)	9	56.25	29	78.38	NS	38	71.70
Fat globules (≥+)	8	50.00	31	89.19	NS	39	73.58
Muscle fibers (≥+)	10	62.50	33	83.78	NS	43	81.13
Protozoa	4	25.00	11	29.73	NS	15	29.31
E. histolitca	4	25.00	10	27.03	NS	14	26.31
G. lamblia	0	0.00	1	2.70	NS	1	1.89
Parasitic ova	2	12.50	3	8.11	NS	5	9.43
Ascaris	1	6.25	2	5.41	NS	3	5.66
H. diminuta	1	6.25	0	0.00	NS	1	1.89
H. nana	0	0.00	1	2.70	NS	1	1.89

NS = Not Significant, H = Himenolipus, E = Entamoeba, G = Giardia, St. Katharine (K), El- Tour (T), (≥+) = More than or equal 1 plus

urinary tract stones. However there was no statistically significant difference between the 2 areas.

Table 8 shows the stool analysis in a randomized sample in El-Tour (T) and St-Katharine (K) areas, there was high incidence of gastrointestinal infection indicated with increased RBCs (26.24%) and increased pus cells (49.06%) in the whole sample. There was also evidence of increased incidence of maldigestion, protozoal infection and parasitic infestation. However there was no statistically significant difference between the 2 areas.

DISCUSSION

Today Bedouins are no longer considered nomads but rather a community that establish permanent housing. However, they still lack of proper health services, electricity and running water supply. Even in developed nations, the socio-economic and health indicators of the Bedouin are similar to those found in developing country populations (Abu-Saad *et al*., 2006).

Present data shows increased incidence of wasting and stunting where anthropometric measurements lack behind those of normal children. About 20.82% of all children included were below the 5th weight-for age percentile and 13.13% of them were below the 5th height-for age percentile. General decrease in the triceps skin-fold in whole Bedouin children compared to reference values was also detected. Our previous report in 1998 for Bedouin children living in central arid area of north Sinai showed higher values as 48.8 and 49.5% were below 5th percentile for age regarding height and weight respectively (Yamamah, 1998). Back then we contributed such stunting to lack of nutrition.

In a previous study, Growth and feeding practices of 353 Bedouin infants from the Negev Desert, Israel, were compared to those of 302 Jewish infants from the same area and to American standards. Authors argue about the general belief that marked stunting is the result of prolonged severe malnutrition. They related this phenomenon to differences in cultural and genetic backgrounds, as well as different feeding practices and increased morbidity (Dagan *et al*., 1983; Forman *et al*., 1990). However it is recommended to report anthropometric measures in relation to international reference values to detect the proper nutrient state (WHO, 1985).

Slight improvement of wasting and stunting in Bedouin children in the present data than previous report in 1998 could be related to slight improvement in nutrient supply and in health services. However it still lacks behind levels in normal urban children. Stunting in Bedouin children predisposed them to serious infection where 95% of Bedouin children hospitalized from serious pneumonia were stunted (Coles *et al*., 2005). In this study we did not evaluate the exact nutritional history of Bedouin families and further studies are needed to relate such wasting and stunting to nutritional defect alone.

Intestinal malabsorption elicited in this study using the xylose test was markedly elevated (88%). Such incidence might play a role in thinning and stunting detected in those Bedouin children. In depth studies are needed to verify such malabsorption and its relation to certain diseases, nutritional habit and parasitic infestation.

Previous report of Bedouin in south Israel showed *Giardiasis* in 8.4%, *Entamoeba histolytica* (<0.1%), (El-On *et al*., 1994). Present results showed less *Giardiasis* (1.8%) but marked increase in Entamoeba histolytica (26.4%). The effect of these parasites on growth deserves further investigations (Fraser *et al*., 2000).

Ascaris lumbricoides was detected in 5.6% of children in this study. An association between *Ascaris lumbricoides* and both educational achievement (Hadidjaja *et al*., 1998) and decreased growth rates in underprivileged populations (Hagel *et al*., 1999) has long been recognized.

Nutritional defect due to insufficient supply or/and unhealthy nutritional habits together with increased incidence of maldigestion, protozoal infection and parasitic infestation could explain the cause of wasting and stunting detected in our study. Same was concluded by Beverly and Handerson (2003) in their study.

Skin diseases show high incidence in the study groups. This may be due to sun exposure, dietetic habits, limited water supply and bad hygiene. Increased exposure to sun rays may explain the significant increase of skin diseases in males compared to females.

There has been observed a worldwide increase in childhood asthma. Bedouin children in the south of Israel showed 7.8% of them asthmatic (Morad *et al*., 2004). Present study incidence of asthma is much lower as only 1.83 of males appear to be asthmatic and no female appear to show evidence of asthma. The difference between sexes in this study might be contributed to cultural factors and the bad habit of smoking in this community even in a young age.

Urinary tract infections usually occur as a consequence of colonization of the periurethral area by a virulent organism that subsequently gains access to the bladder (Hellerstein, 1998). Lack of bathing and proper hygiene may be the direct cause of increase the incidence of urinary tract infections in our examined Bedouin children. Crystaluria with increase urinary oxalate in 30.09% and urate crystals in 83.19% of the tested group may be related to genetic and diet habits of those Bedouin. Urinary crystal precipitation is the necessary initial step in kidney and urinary tract stone formation (Daudon *et al*., 2005). In the pediatric population, most bladder calculi are composed mainly of ammonium acid urate, calcium oxalate, or an impure mixture of ammonium acid urate and calcium oxalate with calcium phosphate. These children also usually have a high intake of oxalate-rich vegetables (increased crystalluria) and animal protein (low dietary citrate) (Basler and Ghobriel, 2006).

We conclude that wasting and stunting are high. Nutritional defect due to insufficient supply or/and unhealthy nutritional habits together with increased incidence of maldigestion, malabsorption, protozoal infection and parasitic infestation could be the explanation. Urinary tract infections and crystaluria were abundant. Many of these health problems are preventable. Proper improvement of unhealthy cultural habits and nutrient supply with proper nutritional educations, hand to hand with raising socio-economic status and accessible better health services are mandatory for those Bedouins.

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