Child Health Indicators in Shareq Elneel Locality, Khartoum State, Sudan: A Cross-Sectional Study

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Abstract: *Objective*: To study child health status in Shareq Elneel Locality and its administrative units, Khartoum State, Sudan.

Methods: A two stages cluster sampling, cross-sectional study was conducted in Shareq Elneel Locality and it is eight administrative units in Khartoum State, Sudan, in 2008. Questionnaires were collected from the caretakers of 5858 child under-5 years of age and anthropometric measurements were taken for children whose parents were consented.

Results: 69.4% of under 5 years children received the third dose of Poliomyelitis vaccine (Polio3) in the locality, 66.5% of under 5 years children received DPT3 vaccination in the locality, 71.9% of under 5 years children received Measles vaccination in the locality and 91.4% of the children under- 5 years in the locality had immunization card. There was evidence of a significant association between children under -5 measles vaccination and women's highest level of school attended (P-Value= 0.04). Nearly one third of the under 5 children were moderately underweight and 16.2% them were severely underweight, More than one fifth of under 5 years children were moderately wasted, and 12% of children under -5 years old were severely wasted, 44.6% of children under -5 years of age were moderately stunted with obviously high percentage in the rural administrative units. More than one quarter of the children under- 5 years old were severely stunted and overweight prevalence of children under-5 years old in the locality was 14.6%. Only 21.4% of the children aged less than 2 years in the locality were exclusively breastfed. 27.5% of children under -5 years of age in the locality had diarrhea in the last 2 weeks preceding the survey, highest percentage found in the rural administrative units. 6.5% of children under 5 years of age in the locality had fever in the last 2 weeks preceding the survey and nearly one third of under 5 years children in the locality had cough in the last 2 weeks preceding the survey. 87.9% of children targeted by vitamin A supplementation in the locality ever receive vitamin A dose.

Conclusions: The study reveal pronounced variations among urban and rural administrative units in regard to many of the survey indicators. Immunization activities do not reach their target in almost all the times in the locality and there were other aspects of child health related to hygiene, poverty, malnutrition and health services like diarrhea, respiratory tract infections and malnutrition which need more consideration to be improved. Malnutrition prevalence was high. The rates of diarrhea and suspected pneumonia are somehow higher in the study area than previous studies figures. Reduce the pronounced variations among urban and rural administrative units in regard to Primary Health Care services and activities in order to improve many of the Child Health indicators in the rural areas. Use effective methods of health promotion and new attractive material of health education in the locality concerning the weak Child Health indicators.

Keywords: Under five children, Immunization, Exclusive breastfeeding, Malnutrition, Rural administrative Units.

INTRODUCTION

Most of the child health indicators indicate that child health problems are the main public health problems in Sudan and it is clear that the country will face many problems with this recent trend to reach the Millennium Development Goals (MDGs) by 2015 which aims to a reduction of infant mortality by two-thirds [1]. The same picture is seen in Shareq Elneel Locality (the area of the study) as showed by the annual reports of the Locality which showed that child health indicators are still far lagging behind and need more support [2]. There are many affordable interventions and technologies in existence that would prevent nearly all of these child health problems. The challenge, therefore, is not a lack of technology, but also application of these technologies at the community level has to be accompanied by the necessary planning and resources. This shows that there is a need for conducting a detailed survey that could help in understanding the exact situation in the locality and it is grassroots. The objective of this study was to study the health status of the under 5- children at the administrative unit level by determining the child health indicators regarding: immunization, nutritional status, breast feeding, vitamin A supplementation and children morbidity including malaria, ARI and diarrheal diseases. By understanding the exact indicators at the locality, this will help us to make specific plans to solve the problems of child health**.**

METHODOLOGY

This study was a cross-sectional community-based study of child Health. It was conducted in Shareq Elneel Locality which is one of the seven localities of Khartoum state, the capital of Sudan. Shareq Elneel Locality is located in the south east of Khartoum State.

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The population of Shareq Elneel Locality is administratively residing in eight administrative units: two of them considered as urban (Sharq Alneel and Alhaj-Yousif) and the other six are rural (Alalafoon, Umdawanban, Alasailat, Wadi Suba, Wad Abu-Salaih, and Abu-Dlaig). The study population comprises Children from birth up to 5 years old living in Shareq Elneel Locality. The study population was selected from households according to the sampling procedure. The Administrative units (sub-locality units) were considered as the main sampling domains and a two stage sample design was used for this Survey. The first level corresponds to the major geographic domains defined, that is, the 8 administrative units of the locality. The primary sampling units (PSUs) were the quarters in urban areas and villages in rural areas and the secondary sampling units (SSUs) were the households. Within each administrative unit the PSUs were selected with Probability Proportional to Size (PPS) and the SSUs (households) were selected systematically with random start from the listing in each sampled PSU. The target population included children less than 5 years of age. A frame of villages/quarters was developed for each administrative unit with approximate population and number of households (obtained from Locality Primary Health Care directorate). The sample size for a particular survey was determined by the precision required for the survey estimates for each domain (Administrative unit), as well as by the resources and operational constraints. The estimation formula for the sample size, n, is $n = z^2 \times (P)\ (1\text{-}P)\ (1+ r) \times deff / d^2$, Where: n = the required sample size, (number of households per Administrative unit), z = 1.96, the value in the normal distribution that gives level of confidence 95%, P = the prevalence rate of the key indicator, (when selecting P = 0.5 this will yield the maximum sample size) [3], r = rate of non-response (r = 10%), Deff = the design effect, (deff = 2) and d = the desired margin of error, (d = 0.05). By substitution: $n= (1.96)^2 \times (0.5)\ (1\text{-}0.5)\ (1+ 0.1) \times 2 / (0.05)^2$, n = 845.152 Households. Equally reliable results were wanted for each domain (administrative unit), so the overall sample size of the locality, n, was increased and multiplied by a factor of about the number of domains (8 administrative units), and thus selecting (n) cases in each domain [3]. Then the total sample size = 845.152 x 8 Administrative units = 6761 households for the locality. The proposed cluster size was 25 households. This gave a total number of 271 clusters for the whole Locality, which was distributed proportionally to the different administrative units. Data was collected using a structured questionnaire, which was purposely designed and formulated for this research guided by UNICEF Multiple Indicator Cluster Survey (MICS) manual 2005 [3] and Sudan House Hold Survey (SHHS) 2006 questionnaire [4]. The survey tools were including one questionnaire which was Children Questionnaire that was collected from the caretakers of all children less than five years of age. The questionnaire included the following modules: Under-5 children information panel, vitamin A supplement, child morbidity, breast feeding and immunization. Questionnaires were managed by trained data collectors who have an experience as research assistants. A pretest of questionnaire, translated into their local language (if they did not understand) was done two weeks prior to the study date. Trained data collectors who were volunteers from the state ministry of health and one community health worker, preferably all those who have an experience as a research assistant, interviewed the subjects using the structured questionnaire. A pretest or a 'try-out' of the questionnaire was carried out on 50 households. They were chosen randomly and they were comparable, thus having similar characteristics with the study subjects, they were not included as study subjects during the actual study duration. The result was used in order to examine the practicability, and reliability of the questions. The study questionnaire was adjusted accordingly. Questionnaires check was conducted by the supervisors themselves to ascertain validity of data obtained by the data collectors and correction was made. Anthropometric measurements (height/length and weight) were measured by one of the trained data collectors. Height was measured using the micro tape to the nearest 0.1 cm. The children stood erect against a straight wall with a tape suspended two meters from the floor. Children had to remove their shoes before the height was taken. Children less than 2 years length were taken in a supine position. Body weight was measured on children fully dressed, with light clothing, but without shoes. It was measured with Seca spring balance to the nearest 0.5 kg. Children less than 2 years weights were taken using Salter scale. The height/length and weight of the children were compared with the reference values of WHO and the nutritional status was classified based on the recommendations of WHO. Children with Height-for-Age of two standard Deviation (SD) below the reference values median, were considered stunted, those with a Weight-for-Age two SD below the reference values median were categorized as underweight and wasting were classed as a Weight-for-Height of two SD below the reference [5]. The Census and Survey Processing System

(CSPro) was used for data entry, verification and editing, CSPro and Statistical Package for the Social Sciences (SPSS) was used for data management and analysis. The data was edited and cleared for double entry and outliers before analysis were done. In this survey, it was virtually assured that a certain level of missing values or nonresponsive occurred. There were two types of nonresponsive; total or unit nonresponsive (when no information was collected on a sampled unit) and partial or item nonresponsive (when the absence of information was only limited to some variables).

Limitations of the Study and Measures to Minimize

Although measures have been taken to reduce the feasible limitations of this study as much as possible, there were still some limitations in the following aspects;

1. Selection bias has known effect on the validity of the study results. Failure to obtain information from a designated individual for any reason (absence or refusal to reply) was expected in this study especially incomplete response when anthropometric measurements requested. To control that enough sample was selected, enough explanation of the benefits and importance of the anthropometric measurements were given. Incomplete achievement subjects for anthropometric measurements accepted as study subjects.

2. In this study recall bias was expected particularly when asking for immunization, breast feeding, iron and vitamin A supplementation and PHC services utilization recall. In order to avoid recall bias, we allowed the caretaker to use any documents to help them to recall. The interviewer asked leading questions and the interviewer ensured getting assistant from other family members while the subject was recalling.

Table 1: Shows frequency and Frequency Percentage of the under 5 Children in Shareq Elneel Locality by Administrative Units and Certain Background Characteristics, 2008

Administrative units	Frequency	Percent	Valid Percent	Cumulative Percent
ELhaj_Yousof	2858	48.8	48.8	48.8
Shareq Elneel	1453	24.8	24.8	73.6
Alailafoon	296	5.1	5.1	78.6
Omdawaan_ban	411	7.0	7.0	85.7
Alaisailat	96	1.6	1.6	87.3
Wadi Soba	495	8.4	8.4	95.7
Wad Abusalih	192	3.3	3.3	99.0
Abudlaiq	57	1.0	1.0	100.0
Total	5858	100.0	100.0	
Background characteristics				
Mode of living				
Urban	4311	73.6	73.6	73.6
Rural	1547	26.4	26.4	100.0
Total	5858	100.0	100.0	
Age groups				
< 6 months	783	13.4	13.5	13.5
6-11 months	696	11.9	12.0	25.6
12-23 months	1301	22.2	22.5	48.0
24-35 months	1143	19.5	19.8	67.8
36-47 months	1072	18.3	18.5	86.3
48-60 months	792	13.5	13.7	100.0
Total	5787	98.8	100.0	
Missing	71	1.2		
Total	5858	100.0		

3. To avoid the measurements bias; a pretest of the questionnaires was carried out two weeks prior to the study date on 50 households. They were chosen randomly and they were comparable thus having similar characteristics with the study subjects, they were not included as study subjects during the actual study duration. The result was used in order to examine the practicability, and reliability of the questions. The study questionnaire was adjusted accordingly and makes the interviewer familiar with the questions. For anthropometric measurements height/Length and weight were measured by one of the data collectors and the same data collector entered the data. Height/Length was measured using the microtoise tape to the nearest 0.1 cm. The children stood erect against a straight wall with a tape suspended two meters from the floor. Children have to remove their shoes before the height was taken. Children less than 2 years length was taken in a supine position. Body weight was measured on children fully dressed, with light clothing, but without shoes. It was measured with Seca spring balance to the nearest 0.5 kg. Children less than 2 years weight was taken using Salter scale. The zero point in the scale was checked from time to time during weighing. Only one Seca spring balance or Salter scale was used throughout the study and the same person who conduct the procedure enter the data.

Ethical Considerations

The ethical clearance was obtained from the PHC director of Khartoum state, Shareq Elneel Locality local authorities and from the Ministry of Health Research Ethics Committee. Prior to any interview or any procedures, the participants were given an explanation on the purpose and nature of the study. If they agreed to participate, then written consent was taken. Respondent children found to be complaining of any symptoms require medical consultation during the interview were referred to the nearest health center. Confidentiality on data and privacy were rigorously protected. Research team was trained adequately in this aspect. Access to the confidential data would be limited to the researcher.

RESULTS

69.4% of under 5 years children received the third dose of Poliomyelitis vaccine (Polio3) in the locality, highest percentage found in Shareq Elneel and the lowest percentage found in Abudlaiq and Um_dawaan_ban administrative units. 66.5% of under 5 years children received DPT3 vaccination in the locality, highest percentage found in Shareq Elneel and the lowest percentage found in Abudlaiq administrative unit. 71.9% of under 5 years children received Measles vaccination in the locality, highest percentage found in Alaisailat and the lowest percentage found in Abudlaiq administrative unit. 91.4% of the children under- 5 years in the locality had immunization card, but only 35.6% of them their cards were seen. Wad Abusalih and Alailafoon administrative units showed highest percentages of the card seen. There was evidence of a significant association between children under -5 measles vaccination and women's highest level of school attended. There is no evidence of a significant association between children under -5 years of age measles vaccination and household income. Nearly one third of the under 5 children were moderately underweight and 16.2% them were severely underweight, highest percentage found in Wad_abusalih administrative unit. 44.6% of children under -5 years of age were moderately stunted with obviously high percentage in the rural administrative units. More than one quarter of the children under- 5 years old were severely stunted, highest percentage found in Wadi_soba administrative unit. More than one fifth of under 5 years children were moderately wasted, and 12% of children under -5 years old were severely wasted, highest percentage in Wad_abusalih administrative unit. Overweight prevalence of children under-5 years old in the locality was 14.6%. Only 21.4% of the children aged less than 2 years in the locality were exclusively breastfed, highest percentage found in Alaisailat and the lowest percentage found in ELhaj_Yousof administrative unit. 20.5% of the children less than 2 years in Shareq Elneel Locality breastfed less than 12 months, 18.4% breastfed less than 6 months. There was no evidence of a significant association between under 2 years children exclusive breast feeding and highest level of school attended by the mother and household income. 27.5% of children under -5 years of age in the locality had diarrhea in the last 2 weeks preceding the survey, highest percentage found in the rural administrative units. 6.5% of children under 5 years of age in the locality had fever in the last 2 weeks preceding the survey, high percentage found in the rural administrative units except Alaisailat. Nearly one third of under 5 years children in the locality had cough in the last 2 weeks preceding the survey, highest percentage found in rural administrative units. There

Table 2: Shows the Association between under - 5 Children Measles Vaccination and Highest Level of School Attended by the Mothers in Shareq Elneel Locality, 2008

Child ever given Measles vaccination						
Highest level of school attended		**Yes**	**No**	**Do not Know**	**Not Stated**	**Total**
Primary	Count	929	188	4	643	1764
	% of Total	16.0	3.2	0.1	11.1	30.3
Intermediate	Count	219.0	32.0	0.0	181.0	432.0
	% of Total	3.8	0.6	0.0	3.1	7.4
Secondary	Count	654.0	132.0	3.0	575.0	1364.0
	% of Total	11.2	2.3	0.1	9.9	23.4
Secondary +	Count	378.0	58.0	3.0	373.0	812.0
	% of Total	6.5	1.0	0.1	6.4	14.0
Illiteracy Curriculum	Count	48.0	4.0	0.0	41.0	93.0
	% of Total	0.8	0.1	0.0	0.7	1.6
Non-standard curriculum	Count	31.0	5.0	0.0	15.0	51.0
	% of Total	0.5	0.1	0.0	0.3	0.9
None	Count	725.0	133.0	5.0	438.0	1301.0
	% of Total	12.5	2.3	0.1	7.5	22.4
Total	Count	2984.0	552.0	15.0	2266.0	5817.0
	% of Total	51.3	9.5	0.3	39.0	100.0

P-Value = 0.044.

Table 3: Shows Percentage Distribution of under 5 Years Children According to the Result of under 5 Children Anthropometric Measurements in Shareq Elneel Locality by Administrative Units, 200

Administrative units	Measured	Not present	Refused	Others	Not Stated	Number of children
ELhaj_Yousof	76.3	10.4	4.9	6.4	2.1	2858
Shareq Elneel	79.4	7.4	2.7	7.8	2.7	1453
Alailafoon	77.4	5.4	4.1	6.8	6.4	296
Omdawaan_ban	83	5.8	5.6	3.6	1.9	411
Alaisailat	88.5	3.1	2.1	5.2	1	96
Wadi Soba	77	5.9	8.3	4.2	4.6	495
Wad Abusalih	85.9	3.1	6.3	3.1	1.6	192
Abudlaiq	71.9	10.5	14.0	3.5		57
Shareq Elneel Locality	78.1	8.3	4.7	6.2	2.6	5858

was evidence of a high significant association between under 5 children who had diarrhoea in last 2 weeks and child age group. There was no evidence of a significant association between children under- 5 years of age who had diarrhoea in the last 2 weeks and their mother's highest level of education and household income. 87.9% of children targeted by vitamin A supplementation in the locality ever receive vitamin A dose, higher percentages found in ELhaj_Yousof, Omdawaan_ban and Alaisailat administrative units.

DISCUSSION

Child immunization

DPT

The immunization coverage with DPT3 of under 5 years children was 66.5% (using vaccination card and mother report for those having no vaccination card) in Shareq Elneel Locality compared to 54.8% coverage of children 12-23 months of age in Khartoum state as

Table 4: Shows Percentage Distribution of under 5 Years Children According to Severe or Moderate Underweight in Shareq Elneel Locality by Administrative Units, 2008

Admin-units	Weight-for-age (%)			Number of children
	Moderate Underweight (% below-2 SD)	Sever Underweight (% below-3 SD)	Not applicable	
ElHaj yosuf	29.5	15	55.5	2180
Shareq Elneel	24.6	11.9	63.5	1154
Al_ailafoon	39	22.1	38.9	229
Om_dawaanban	39.1	17.9	43	341
Al_isailat	35.9	20.5	43.6	85
Wadi_soba	43.9	26.5	29.6	381
Wad_abusalih	45.9	27.7	26.4	165
Abu_dlaiq	26.3	15.8	57.9	41
Shareq Elneel Locality	31.2	16.2	52.6	4576

Table 5: Shows Percentage Distribution of under 5 Years Children According to Severe or Moderate Stunting in Shareq Elneel Locality by Administrative Units, 2008

Admin-units	Height-for-age (%)			Number of children
	Moderate Stunting (% below-2 SD)	Sever Stunting (% below-3 SD)	Not applicable	
ElHaj yosuf	42.3	24.1	33.6	2180
Shareq Elneel	40.4	23.1	36.5	1154
Al_ailafoon	49.5	25	25.5	229
Om_dawaanban	51.4	32.3	16.3	341
Al_isailat	54.1	28.4	17.5	85
Wadi_soba	57.5	35.2	7.3	381
Wad_abusalih	52.5	31.7	15.8	165
Abu_dlaiq	48.7	25.6	25.7	41
Shareq Elneel Locality	44.6	25.6	29.8	4576

Table 6: Shows Percentage Distribution of under 5 Years Children According to Severe or Moderate Wasting in Shareq Elneel Locality by Administrative Units, 2008

Admin-units	Weight-for-Height (%)			Number of children
	Moderate Wasting (% below- 2 SD)	Sever Wasting (% below- 3SD)	Overweight (% below + 2 SD)	
ElHaj yosuf	19.6	11.2	14.8	2180
Shareq Elneel	18	10.2	13.9	1154
Al_ailafoon	21.3	12.8	15.2	229
Om_dawaanban	19.8	10.6	17.3	341
Al_isailat	26.5	14.7	4.4	85
Wadi_soba	25.9	18.3	14.4	381
Wad_abusalih	30.6	24.8	17.4	165
Abu_dlaiq	16.7	10	10	41
Shareq Elneel Locality	20.2	12	14.6	4576

Table 7: Shows the Association between Children under 5 Years who had Diarrhea in the Last 2 Weeks and Child Age Group in Shareq Elneel Locality, 2008

Child had Diarrhoea in last 2 weeks						
Child Age Group		**Yes**	**No**	**Do not Know**	**Not Stated**	**Total**
Less than 6 months	Count	192	573	0	1	766
	% of Total	3.3	9.9	0.0	0.0	13.3
6-11 months	Count	286.0	407.0	0.0	2.0	695.0
	% of Total	5.0	7.1	0.0	0.0	12.1
12-23 months	Count	506.0	789.0	0.0	2.0	1297.0
	% of Total	8.8	13.7	0.0	0.0	22.5
24-35 months	Count	307.0	830.0	0.0	5.0	1142.0
	% of Total	5.3	14.4	0.0	0.1	19.8
36-47 months	Count	193.0	878.0	0.0	1.0	1072.0
	% of Total	3.3	15.2	0.0	0.0	18.6
48-59 months	Count	108.0	682.0	2.0	0.0	792.0
	% of Total	1.9	11.8	0.0	0.0	13.7
Total	Count	1592.0	4159.0	2.0	11.0	5764.0
	% of Total	27.6	72.2	0.0	0.2	100.0

P-Value = 0.000.

found in SHHS in 2006 [4]. Compared to other countries DPT3 coverage, it was 73% in Ethiopia [6], 75% in Indonesia [7], 65.1% (of under 2 years children) in Tikrit city in Iraq [8], 84% (of children aged 13-59 months) in Buenos Aires in Argentina [9], 80.7% (of children from birth up to 60 months of age) in a slum in Chandigarh in India [10], and 77.5% (of children aged 12-23 years) in an urban Community of Miraj in India using Lot Quality Technique for Assessment of Vaccination Performance [11]. The highest administrative units were Shareq Elneel (77.7%), then Alaisailat (73%), the two are urban and rural administrative units respectively. Lowest percentage found in Abudlaiq administrative unit (31.6%).

Measles

Measles vaccination coverage was 70.9% in the locality. Highest administrative unit was Alaisailat (77.1%) and lowest was Abudlaiq (61.4%), this percentage was less than the one found in SHHS 2006 for the whole Khartoum state which was 84.2% [4] of children 12-23 months of age. Compared to other countries measles coverage was 65% in Ethiopia [6], 80% in Indenosia [7], 58.3% (of under 2 years children) in Tikrit city in Iraq [8], 92% (of children aged 13-59 months) in Buenos Aires in Argentina [9], 78.3% (of children from birth up to 60 months of age) in a slum in Chandigarh (U.T) India [10], and 93.75% (of children aged 12-23 years) in an urban Community of Miraj in India using Lot Quality Technique for Assessment of Vaccination Performance [11].

There was significant association between measles vaccination of children under-5 and the highest level of education of the mother (P-Value= 0.04) while there was no significant association between measles vaccination of children under -5 years of age and household income in the locality.

Presence of Vaccination Card

Presence of vaccination card was found to be low for the whole locality (35.6%). This may be due to fact that mothers keep the card in the baggage or somewhere that it would be difficult for them to bring it at the time of the study, or some of them may have lost it, if we add the percentage of "The card is seen" to " The card is not seen" it gave 91.4% which was accepted percentage compared to 72.2% (of children 12-23 months of age) found in SHHS 2006 for the whole Khartoum state [4]. Compared to other countries presence of vaccination card was 87.5% (of under 2 years children) in Tikrit city in Iraq [8], 85.1% (of children aged 13-59 months) in Buenos Aires in Argentina [9], 93.2% (of children from birth up to 60 months of age) in a slum in Chandigarh (U.T) India [10] and 81.25% (of children aged 12-23 years) in an urban Community of Miraj in India using Lot Quality

Technique for Assessment of Vaccination Performance [11].

Overall vaccination coverage of DPT3, BCG, Polio3, measles and the presence of vaccination card were not acceptable when compared to the situation inside the country, vaccination coverage in other countries, and were not satisfying when compared to the WHO standard which is not less than 90% for DPT3, BCG, Polio3 vaccination and 85% for measles. These need more effort to increase mother's awareness and motivate them to complete their children vaccination. It should be considered here in this study that the vaccination coverage was taken from under 5 years children which is different from the previous other studies and SHHS.

Nutritional Status and Breast Feeding

Children nutritional status is a reflection of their health. When children have access to an adequate food supply, well protected from repeated illness, and best care is devoted to them, they reach their growth potential and are considered well nourished.

Approximately one third (31.2%) of children under 5 years in Shareq Elneel Locality were found to be moderately underweight while 16.2% were severely under weight, when comparing these results with that of SHHS [4] 2006 in Khartoum state 21% were moderately under weight and just 3.5% were severely under weight, another Multiple Indicator Cluster Survey (MICS) done in Sudan in 2000 showed that 36.3% of under 5 children in Khartoum state were found to be moderately underweight while 10.4% were severely underweight [12]. Percentage of moderately underweight was 27% and 11% for severely underweight in Ethiopia in 2007[6]. In Indonesia the percentage was 19% for moderately under weight and 9% for severely underweight [6]. A study done in rural Bangladesh showed that 40.3% of children 1-5 years were under weight [13]. Another study done in urban slums of Tripuri Town, Patiala in India showed that 38.38% of children 1-5 years were under weight [14]. Highest percentages of underweight were found in rural administrative units in the locality.

More than one third (44.6%) of children under 5 years in Shareq Elneel Locality were found to be moderately stunted while 25.6% were severely stunted (too short for their age). When comparing these results with that of SHHS [4] 2006 in Khartoum state 25.5% were moderately stunted and 11.7% were severely stunted, MICS [15] done in Sudan in 2000 showed that 32.1% of children under -5 years of age in Khartoum state were found to be moderately stunted while 15.3% were severely stunted. 47% for moderately and sever stunting in Ethiopia in 2007 [6]. A study done in urban slums of Tripuri Town, Patiala in India [14] showed that 46.06% of children 1-5 years were stunted with 36.10%, 8.09% and 1.87% showing mild, moderate and severe stunting respectively. Highest percentages were found in rural administrative units of our study area.

Approximately one out of five (20.2%) of children under 5 years in Shareq Elneel Locality were found to be moderately wasted while 12% were severely wasted. In SHHS [4] 2006 in Khartoum state 11.2% were moderately wasted and just 1.9% were severely wasted. MICS carried in Sudan [15] in 2000 showed that 13.9% of under 5 years in Khartoum state were found to be moderately wasted while 1.9% were severely wasted. Highest percentages were found also in rural administrative units.

Overweight prevalence in Shareq Elneel Locality under five children was 14.6% compared to 4% in Khartoum state as stated in SHHS[4] 2006, and 0.9% in a study done in rural Bangladesh [13]. Surprisingly highest prevalence was found in Om-dhawan- ban and Wad-Abu-Salih administrative units which are rural administrative units with high percentages of malnutrition this may be due to socio-economic status variation in the same community which start to be obvious in Sudanese communities.

Percentage of children ever been breast fed was 94.6% in Shareq Elneel Locality, reaching up to 100% in Alaisalat administrative unit. 21.4% under 2 years children were exclusively breast fed (infants less than 6 months fed only by breast milk), this percentage was low when compared with that found in the whole Khartoum state in SHHS [4] 2006 which was 39.6% and MICS in 2000 which was 22.4% [15]. Compared to other countries the percentage of exclusive breast feeding was nearly double or more than double of that in Shareq Elneel Locality, it was 49% in Ethiopia [6], 40% in Indonesia [7], 62% in India [10]. The situation in developed countries is not differ very much, for example a study done in U.S.A showed that the prevalence of exclusive breast feeding among children still being breastfed was approximately 52% at 7 days after birth, 40% at 2 months, 29% at 4 months, and 22% at 6 months [17].

It is deserve notice that our prevalence of exclusive breast feeding was much low in comparison to that in some developing countries. This needs more investigations to clarify the reasons behind that, because our health situation is not better than the previous developing countries and no doubt it need to get the great benefits of exclusive breast feeding. 20.5% of the children less than 2 years in Shareq Elneel Locality breastfed less than 12 months, 18.4% breastfed less than 6 months. There was no significant association between exclusive breast feeding of less than 2 years children and the highest level of education of the mother and household income in the locality.

Child Morbidity

Percentage of under five years children in the locality who had diarrhea in the last two weeks was 27.5%. Higher percentages reported in rural administrative units as found in Abudlaiq (45%), wadi soba (39.2%), Wad Abusalish (38%) and Alaisailat (37.4%). In the SHHS [4], diarrhea prevalence was 20% in Khartoum state, also compared to 32.7% in MICS done in Khartoum state in 2000 [15]. A community-based cross-sectional study was conducted in Nekemte town, western Ethiopia in 2007 showed that diarrhoea morbidity prevalence over a period of two weeks preceding the study was about 28.9% [15]. Our study was done in summer towards autumn.

Children suspected of having pneumonia in the present study were 30.7% while in Khartoum state as found SHHS [4] they were 12.8% and they were 5% in MICS [12] done in 2000. Compared to other countries percentage was 15% in Ethiopia [6] and 61% in Indonesia [7]. Higher rates were reported in the rural administrative unit as found in Abudlaiq (46.8%), Alaisailat (38.1%), Wadi soba (37.7%) and Omdawaan_ban (37.4%).

Percentage of children who had fever suspected to be malaria was 6.5% in Shareq Elneel Locality, the highest in Wadi Soba (11.6%) and lowest in ALaisailat (2.1%). In Khartoum state it was 7.9%, in the SHHS 2006 [4] and 16.8% in MICS 2000 [15]. Compared to other countries percentage was 10% in Ethiopia [6] and 1% in Indonesia [7].

A survey done in India comparing children morbidity between an urban slum areas and Middle-Income Group (MIG) areas in Surat city showed that around two third of the boys (68.1%) on the day of survey had history of cough within last fifteen days in urban slum as compared to 52.1% boys in MIG area. In the same way two third of the girls (67.1%) had similar complaint in urban slum and 52.8% girls in MIG area. Nearly one-third girls (23.4%) in urban slum had history of fever as compared to 18.0 % girls in MIG area. Sex wise more girls reported with history of fever as compared to the boys (22.1%) in urban slum and (13.5%) in MIG area. One fifth of the girls (21.6%) had history of diarrhoea in urban slum area within last fifteen days as compared to 10.6% in MIG area. However the boys did suffer from diarrhoea in last 15 days on the day of survey but in fewer proportions than girls [19].

There was significant association between children under-5 years of age who had diarrhoea in last 2 weeks and the age of the child and there was no significant association between highest level of education of the mother and household income and under 5 children who had diarrhoea in last 2 weeks in the locality.

Vitamin A Supplementation

Percentage of children ever received vitamin A dose were 87.9% in the locality, the highest percentage was 90.4% which was found in EL-haj- Yousif administrative unit and the lowest percentage was 81.8% which found in Abudlaig administrative unit. About 73.3% of children targeted by vitamin A supplementation in the locality received vitamin A dose less than 6 months ago, highest percentage found in Omdawaan_ban (76.1%) and ELhaj_Yousof (75.6%) administrative units. In Khartoum state the percentage was 82.1% in MICS 200039 and it was 92.5% in SHHS [4], this is somehow higher than that found in the present study. Percentage was 88% in Ethiopia [6] in 2007 and it was 87% in Indonesia [7]. Another study done in the Ethiopia (Demographic and Health Survey of 2005) among 4762 preschool children aged 12–59 months, 46.8% received a vitamin A capsule within the last 6 months [20]. A study conducted in Mali in five regions out of the eight regions in the country, in addition to Bamako District. Three rural communities were selected in three regions to represent rural areas, it was found out that 80% of children 6-59 month old received vitamin A capsule within the last 6 months [21].

CONCLUSION

Some of the conclusions emerging from the survey findings include the following:

- The results indicate that there exist pronounced variations among urban (ELhaj_Yousof and Shareq Elneel) and rural (Alailafoon, Omdawaan_ban, Alaisailat, Wadi Soba, Wad Abusalih and Abudlaiq) administrative units in regard to many of the survey indicators.

- As for child health; immunization activities do not reach their target (The targeted coverage for all vaccination in Khartoum state is 90% except for TT which is 50%) in almost all the times in the locality and there were other aspects of child health related to hygiene, poverty, nutrition and health services like diarrhea, respiratory tract infections and malnutrition which need more consideration to be improved.

- Morbidity of children seen more in rural areas. The rates of diarrhea and suspected pneumonia are somehow higher in the study area than previous studies figures.

- Malnutrition prevalence was high (moderate or severe underweight, stunting and wasting).

RECOMMENDATIONS

1. Reduce the pronounced variations among urban and rural administrative units in regard to PHC services and activities in order to improve many of the Child Health indicators in the rural areas. This could be done by eradicating rural poverty through effective policies and economic growth.

2. Use effective methods of health promotion and new attractive material of health education in the locality concerning the weak Child Health indicators.

3. Revise immunization strategies in the locality especially in the rural administrative units and strengthen monitoring and supervision of vaccination activities in order to improve vaccination coverage.

4. Improve the quality of foods, feeding practices, and the nutrition situation of children.

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