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Behavioral Changes in Egyptian Children With Nephrotic Syndrome

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Original Paper

Introduction. Chronic illnesses, including nephrotic syndrome (NS), are associated with psychosocial stress. Our study aimed to assess psychological problems in children with NS.

Materials and Methods. Sixty children with NS were assessed at the Children Hospital, in Cairo for behavioral changes. They responded to the Arabic version of the Strength and Difficulties Questionnaire. The results were compared between those with steroid-sensitive NS (SSNS), steroid-dependent NS (SDNS), and steroid-resistant NS (SRNS).

Results. Three groups of patients with SSNS, SDNS, and SRNS, each consisting of 20 children aged between 4 and 16 years, were included. The SRNS group was significantly different from the other two groups regarding age at the onset of disease, total serum protein, serum albumin, serum calcium, and estimated glomerular filtration rate (lowest in the SRNS group) as well as 24-hour urine protein, blood urea nitrogen, and serum total cholesterol (highest in the SRNS group). In the SRNS group, the scores for emotional symptoms, peer relationship problems, and the total score were higher and the prosocial score was lower than the other groups, but with no statistical significance.

Conclusions. Emotional symptoms, conduct problems, peer relationship problems, hyperactivity, and the overall poor behavior scores might be more likely to be seen in children with SRNS group than other NS treatment status. We recommend that attention to behavioral problems of children with NS should be given early in the course of disease.

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INTRODUCTION

Nephrotic syndrome (NS) is one of the most common renal disorders in pediatric population. Approximately, 90% of cases are caused by an immunological dysregulation sensitive to corticosteroids.[1] However, the therapeutic benefits of corticosteroids are accompanied by significant side effects.[2] This may be due to increased free serum prednisolone levels measured during periods of hypoalbuminemia.[3]

Physicians are well aware of the spectrum of side effects of long-term steroid treatment, including immunosuppression, osteoporosis, poor growth, and changes in the body fat composition. Possibly underappreciated by physicians, but frequently reported by parents and patients themselves is the impact of steroid treatment on the mental, emotional, and behavioral status of patients. Behavioral and psychosocial adjustments are impaired in children with NS, but the exact mechanism by which

steroids lead to behavioral alterations in humans is unclear.[4] Repeated corticosteroid injections induce depressive behavior in certain animal models, and "steroid psychosis" is a well-known adverse effect of high-dose glucocorticoid treatment.[5] Our study aimed to assess psychological problems in children with nephrotic syndrome.

MATERIALS AND METHODS

Our study was done in the nephrology clinic at New Children Hospital, Cairo University. It was carried out between August 2010 and March 2011 on 60 pediatric patients, of both sexes, presenting with NS. The study was approved by the Ethics Scientific Committee at the Cairo University Hospital and was conducted in accordance with the University bylaws for human research. All parents or caregivers of the participants provided informed consent. Patients were included in the study after fulfilling the following criteria: age between 4 and 16 years and laboratory investigations consistent with NS. Patients with any psychological abnormalities prior to a diagnosis of NS (such as clinical depression and aggressive behavior) and conditions known to be associated with behavioral changes (such as death of one of the parents or their divorce) were excluded.

Three groups of patients were recruited (20 patients each). Group 1 included patients with steroid-sensitive nephrotic syndrome (SSNS), who had remission in response to corticosteroid treatment alone; group 2 were patients with steroid-dependent nephrotic syndrome (SDNS), who responded to initial corticosteroid treatment but developed a relapse either while still receiving steroids or within 2 weeks of discontinuation of treatment following a steroid taper; and group 3 included patients with steroid-resistant nephrotic syndrome (SRNS), who failed to enter the remission stage after 8 weeks of corticosteroid treatment.

All of the children were subjected to detailed history including age, sex, place of residence, age of at the onset of NS, duration of illness, number of relapses, duration of steroid use, current steroid dose, and other treatments. Clinical examination included anthropometrics measurements, vital signs, and presence of edema and any complications. Hypertension was defined as a blood pressure equal to or greater than the 95th percentile for sex and age. Biochemical investigations, including serum total proteins, serum albumin, total serum cholesterol, total serum calcium, blood urea nitrogen, serum creatinine, and 24-hour urinary protein. Kidney biopsy results (if done) were recorded. Estimated glomerular filtration rate (GFR) was also calculated for all of the patients. Chronic kidney disease stages and renal insufficiency were determined based on the standard criteria.[6,7]

All children underwent behavioral assessment using the Strength and Difficulties Questionnaire (SDQ),[8] which is a brief behavioral screening questionnaire for psychological and psychiatric morbidity that provides balanced coverage of children and adolescents' behavior, emotions, and relationships. The parents were asked to complete the questionnaire. This questionnaire is used for children and adolescents ages 4 through 16 years old. The SDQ is considered a brief behavioral screening questionnaire. Despite of its brevity, it correlates highly with the Child Behavior Checklist and is equally effective in detecting internalizing and externalizing problems; in addition, it is considered more sensitive in detecting inattention and hyperactivity.[9] The SDQ has been translated into Arabic. The Arabic version was validated in Gaza strip and Yemen.[10-12]

The SDQ covers 25 attributes. The 25 items are divided into 5 subscales of 5 items each, generating scores for conduct problems, inattention-hyperactivity, emotional symptoms, peer relationship problems, and prosocial behavior. Each item is scored from zero to 2. All subscales except for the last one are summed to generate a total difficulties score (range, 0 to 40). The SDQ scores can be used as continuous variables or by classifying them to normal, borderline, and abnormal. For the hyperactivity subscale, scores of zero to 5 are normal, 6 are borderline, and greater than 6 are abnormal. For the conduct problems and peer problems, zero to 2 are normal, 3 are borderline, and greater than 3 are abnormal. For emotional problems, zero to 3 are normal, 4 are borderline, and greater than 4 are abnormal. For prosocial behavior, zero to 4 are abnormal, 5 are borderline and greater than 5 are normal. For the total scale, zero to 13 are normal, 14 to 16 are borderline, and greater than 16 are abnormal. Normal patients do not need further psychological intervention, but borderline patients need close follow-up and may need psychological intervention, while abnormal

patients need psychological intervention and support. An abnormal score on one subscale or the total difficulties scores can be used to identify likely "cases" with mental health disorders.[8]

The SPSS software (Statistical Package for the Social Sciences, version 19.0, SPSS Inc, Chicago, Ill, USA) and Microsoft Excel software program were used to tabulate the results and represent them graphically. Quantitative variables were expressed as mean and standard error. Qualitative variables were expressed as count and percentage. The 1-way analysis of variance was used to test the differences between groups. The Duncan multiple comparison test was used to test the significant differences between each two groups. The chi-square test was used to compare the distributions between groups. The Pearson correlation coefficient test used to test the significant correlations between the quantitative parameters within each group. A *P* value less than .05 was considered significant.[13]

RESULTS

Sixty children were included in the study, of whom 50 (83.3%) were boys (85% of the SSNS group, 75% of the SDNS group, and 90% of the SRNS group). Duration of steroid use before enrollment in the study was 4.35 ± 0.65 years in the SSNS group, 4.65 ± 0.60 years in the SDNS group, and 4.27 ± 0.57 years in the SRNS group (*P* = .90). There were no significant differences between the three groups with regards to age, body weight, and height, while there the age at the onset of NS was significantly lower in the SDNS group as compared to the other patients (2.85 ± 0.27 years versus 4.16 ± 0.41 years in the SSNS and 4.58 ± 0.64 years in the SRNS group). Table 1 shows demographic and clinical data of the patients in the three groups. Nine of the patients (15%) were hypertensive (1 patient in the SSNS group, 1 in the SDNS group, and 7 in the SRNS group). There were significant differences between the three groups in the 24-hour urinary protein levels, blood urea nitrogen, and serum cholesterol

Table 1. Demographic and Clinical Characteristics of Children With Nephrotic Syndrome*

Characteristic	SSNS	SDNS	SRNS	*P*
Age, y	8.38 ± 0.75	7.48 ± 0.56	8.80 ± 0.82	.42
Sex				
Female	3 (15.0)	5 (25.0)	2 (10.0)	
Male	17 (85.0)	15 (75.0)	18 (90.0)	.88
Weight, kg	28.45 ± 2.21	27.20 ± 1.99	31.7 ± 2.6	.36
Height, cm	125.08 ± 4.73	119.20 ± 3.45	125.95 ± 4.64	.47
Body weight percentile				
< 5th	0 (0.0)	1 (5.0)	3 (15.0)	
5th	2 (10.0)	0 (0.0)	1 (5.0)	
5th to 95th	18 (90.0)	19 (95.0)	15 (75.0)	
> 95th	0 (0.0)	0 (0.0)	1 (5.0)	
Height percentile				
< 5th	0 (0.0)	0 (0.0)	2 (10.0)	
5th	0 (0.0)	3 (15.0)	1 (5.0)	
5th to 95th	20 (100.0)	17 (85.0)	17 (85.0)	
> 95th	0 (0.0)	0 (0.0)	0 (0.0)	
High blood pressure	1 (5.0)	1 (5.0)	7 (35.0)	
Age at the disease onset, y	4.163 ± 0.41	2.85 ± 0.27	4.58 ± 0.64	.03
Duration of illness and steroid use, y	4.35 ± 0.65	4.65 ± 0.60	4.27 ± 0.57	.89
24-hour urinary proteins, g/d	0.11 ± 0.02	0.486 ± 0.15	1.99 ± 0.61	.001
Serum total protein, mg/dL	6.76 ± 0.13	6.40 ± 0.20	5.34 ± 0.26	< .001
Serum albumin, mg/dL	4.06 ± 0.15	3.44 ± 0.22	2.66 ± 0.26	< .001
Serum cholesterol, mg/dL	169.40 ± 7.15	203.55 ± 20.92	304.85 ± 42.85	< .001
Serum calcium, mg/dL	9.03 ± 0.11	9.27 ± 0.17	8.43 ± 0.18	.001
Blood urea nitrogen, mg/dL	10.33 ± 0.74	12.55 ± 1.40	22.20 ± 5.83	.045
Serum creatinine, mg/dL	0.42 ± 0.03	0.43 ± 0.04	1.12 ± 0.39	.05
GFR, mL/min/1.73 m^2	154.95 ± 8.85	146.75 ± 8.88	117.55 ± 13.18	.04

*SSNS indicates steroid-sensitive nephrotic syndrome; SDNS, steroid-dependent nephrotic syndrome; SRNS, steroid resistant nephrotic syndrome; and GFR, glomerular filtration rate.

(being highest in the SRNS group), as well as the total serum protein, albumin, and calcium levels. There were significant differences in the GFR levels (lowest values in the SRNS group).

Table 2 shows current steroid dose, number of relapses, number of immunosuppressants, and biopsy results in studied groups. Twenty-nine patients experienced less than 5, while 14 patients experienced more than 5 relapses. Thirty-six patients were on steroids at time of the study; 33 of them were on alternate-day regimen. Nineteen patients of the SRNS group and 18 patients of the SDNS group received immunosuppressants, while in the SSNS group, no patients received immunosuppressive drugs. Biopsy was done in 6 patients (30%) of the SDNS group and 16 patients (80%) of the SRNS group. The most prevalent pathologic finding was minimal change NS, accounted for 9 of 22 the cases (41%), followed by mesangioproliferative glomerulonephritis in 8 cases (36.4%).

Table 3 shows kidney impairment, associated diseases, complications, and the outcome of the patients. All the associated diseases occurred before

Table 3. Renal Impairment, Associated Diseases, and Outcomes of Children With Nephrotic Syndrome*

Parameter	SSNS	SDNS	SRNS	Total
Renal impairment				
Mild	0	0	1 (5.0)	1
ESRD	0	0	2 (10.0)	2
Associated diseases				
Diabetes mellitus	0	0	1 (5.0)	1
Rectal prolapsed	0	0	1 (5.0)	1
Complications	0	0	3 (15.0)	
Hypertensive encephalopathy	1 (5.0)	0	1 (5.0)	2
Psychosis	0	0	1 (5.0)	1
Pneumonia	0	0	3 (15.0)	3
Cellulitis	0	0	1 (5.0)	1
Peritonitis	0	0	1 (5.0)	1
Urinary tract infection			1 (5.0)	1
Superficial gangrene	0	1 (5.0)	0	1
Deep gangrene	0	0	1 (5.0)	1
Outcome				
ESRD	0	0	2 (10.0)	2
Death	0	0	1 (5.0)	1

*SSNS indicates steroid-sensitive nephrotic syndrome; SDNS, steroid-dependent nephrotic syndrome; SRNS, steroid resistant nephrotic syndrome; and ESRD, end-stage renal disease.

Table 2. Clinical Characteristics and treatment Outcomes of Children With Nephrotic Syndrome*

Paramete r	SSNS	SDNS	SRNS	Total
Current steroid dose				
Not on steroids	12 (60.0)	6 (30.0)	6 (30.0)	24
On daily dose				
≤15mg daily	0 (0.0)	0 (0.0)	1 (5.0)	1
>15mg daily	0 (0.0)	1 (5.0)	1 (5.0)	2
On every other day				
≤15mg EOD	6 (30.0)	10 (50.0)	6 (30.0)	22
>15mg EOD	2 (10.0)	3 (15.0)	6 (30.0)	11
Number of relapses				
no relapses	10 (50.0)	0 (0.0)	7 (35.0)	17
<5 relapses	9 (45.0)	12 (60.0)	8 (40.0)	29
≥5 relapses	1 (5.0)	8 (40.0)	5 (25.0)	14
Number of immunosuppressant drugs				
No drugs	20 (100.0)	2 (10.0)	1 (5.0)	23
1 drug	0 (0.0)	11 (55.0)	8 (40.0)	19
2 drugs	0 (0.0)	5 (25.0)	4 (20.0)	9
3 drugs	0 (0.0)	1 (5.0)	5 (25.0)	6
4 drugs	0 (0.0)	1 (5.0)	2 (10.0)	3
Biopsy results				
Focal proliferative glomerulopathy	0 (0.0)	0 (0.0)	1 (5.0)	1
FSGS	0 (0.0)	0 (0.0)	2 (10.0)	2
Mesangioproliferative glomerulopathy	0 (0.0)	2 (10.0)	6 (30.0)	8
Membranous	0 (0.0)	0 (0.0)	2 (10.0)	2
MCNS	0 (0.0)	4 (20.0)	5 (25.0)	9
not done	20 (100.0)	14 (70.0)	4 (20.0)	38

*SSNS indicates steroid-sensitive nephrotic syndrome; SDNS, steroid-dependent nephrotic syndrome; SRNS, steroid resistant nephrotic syndrome; FSGS, focal segmental glomerulosclerosis; and MCNS, minimal change nephrotic syndrome.

starting the study. In the SDNS group, 1 patient had superficial gangrene of the tips of the fingers of one hand during relapse of nephrotic syndrome and also has associated rectal prolapse and gangrene resolved with heparin and anticoagulants. In the SRNS group, 2 patients passed gradually into end-stage renal disease (ESRD) and started regular hemodialysis shortly after taking the questionnaire, so we did not exclude them from the study as hemodialysis did not affect their behavior as it started after finishing the questionnaire. One patient of the SRNS group developed deep gangrene in one lower limb, shortly after finishing the study, which necessitated above-knee amputation, and eventually he died. Most of comorbidities and complications were in the SRNS group. The patient who developed psychosis had high scores for emotional symptoms, conduct problems, peer relationship problems, and the total scale. The patient who developed hypertensive encephalopathy had abnormal prosocial and borderline peer relationship problems score. The patient who developed deep gangrene and lately died had abnormal emotional and peer relationship problems scores. One of the two patients who developed ESRD had insulin-dependent diabetes and abnormal emotional and total scores and borderline conduct problems scores, while the other patient with ESRD developed urinary tract infection and pneumonia and had abnormal emotional and conduct scores. One patient had cellulitis and abnormal hyperactivity and total scores and borderline conduct problems and 1 patient had pneumonia and abnormal conduct.

There were no significant differences between the three groups with regards to behavioral assessment scores. Tables 4 and 5 show psychological assessment of the studied groups. Emotional symptoms score was within the abnormal range in 11 patients, conduct problems score in 16 patients, hyperactivity score in 4 patients, and peer relationship problems score in 12 patients. The total score was within the abnormal range in 4 patients and prosocial score was abnormal in 3 patients. Abnormal behavioral changes were more likely to be present in the SRNS group, but with no statistically significant differences.

Ten patients were females, and they were less affected psychologically than males. Age of patients in the SSNS with abnormal behavioral assessment was greater than the other 2 groups, but with no statistical significance. In the SRNS group, only 1 patient was obese (weight > 97th percentile) and he had borderline conduct abnormality. Two patients were short (height < 3rd percentile), one of whom had abnormal conduct abnormality and the other had borderline conduct and total score and also abnormal emotional abnormality.

Table 5. Behavioral Assessment Categorization of Children With Nephrotic Syndrome*

Scale	SSNS	SDNS	SRNS	*P*
Emotional symptoms				
Abnormal	2 (10.0)	3 (15.0)	6 (30.0)	.31
Borderline	2 (10.0)	2 (10.0)	3 (15.0)	.71
Conduct problems				
Abnormal	6 (30.0)	3 (15.0)	7 (35.0)	.44
Borderline	5 (25.0)	2 (10.0)	3 (15.0)	.50
Hyperactivity				
Abnormal	1 (5.0)	1 (5.0)	2 (10.0)	> .99
Borderline	1 (5.0)	4 (20.0)	0	.18
Peer relationship problems				
Abnormal	3 (15.0)	4 (20.0)	5 (25.0)	> .99
Borderline	4 (20.0)	5 (25.0)	3 (15.0)	.13
Total score				
Abnormal	1 (5.0)	1 (5.0)	2 (10.0)	> .99
Borderline	4 (20.0)	3 (15.0)	4 (20.0)	.13
Prosocial behavior				
Abnormal	1 (5.0)	0	2 (10.0)	.56
Borderline	1 (5.0)	0	0	…

*SDQ indicates Strength and Difficulties Questionnaire; SSNS, steroid-sensitive nephrotic syndrome; SDNS, steroid-dependent nephrotic syndrome; and SRNS, steroid resistant nephrotic syndrome.

Table 4. Behavioral Assessment Scores of of Children With Nephrotic Syndrome*

Scale	SSNS	SDNS	SRNS	*P*
Emotional symptoms	2.20 ± 0.38	2.40 ± 0.42	3.35 ± 0.50	.15
Conduct problems	2.85 ± 0.43	1.90 ± 0.44	2.65 ± 0.46	.29
Hyperactivity	3.10 ± 0.48	3.40 ± 0.54	3.10 ± 0.42	.88
Peer relationship problems	2.00 ± 0.46	2.20 ± 0.34	2.40 ± 0.37	.77
Total score	10.00 ± 1.04	9.90 ± 1.15	11.50 ± 1.27	.55
Prosocial behavior	8.80 ± 0.47	9.35 ± 0.26	8.55 ± 0.44	.36

*SSNS indicates steroid-sensitive nephrotic syndrome; SDNS, steroid-dependent nephrotic syndrome; and SRNS, steroid resistant nephrotic syndrome.

Tables 6 to 8 show the steroid dose, relapse, immunosuppressant use in relation to psychological and behavioral assessment in the three studied groups. Data was failed to show an association between these parameters and the behavior of the patients.

Figures 1 to 4 depict the correlation of clinical and laboratory parameters with behavioral assessment scores. Serum cholesterol level was associated with lower prosocial scores and higher peer relationship scores of the SRNS group. A higher prosocial score was also linked with a longer duration of illness and being younger at the onset of NS in the SRNS group.

Table 6. Behavioral Abnormalities by Steroid Therapy in Children With Nephrotic Syndrome*

SDQ Subscale	SSNS, n		SDNS, n		SRNS, n	
	No Steroid	Steroid	No Steroid	Steroid	No Steroid	Steroid
Emotional symptom						
Abnormal	2	0	1	2	3	3
Borderline	1	1	0	2	0	3
Conduct problems						
Abnormal	5	1	1	2	4	3
Borderline	2	3	0	2	1	2
Hyperactivity						
Abnormal	1	0	1	0	0	2
Borderline	1	0	0	4	0	0
Peer relationship problems						
Abnormal	2	1	0	4	0	5
Borderline	3	1	3	2	0	3
Total scale						
Abnormal	1	0	1	0	0	2
Borderline	3	1	0	3	2	2
Prosocial behavior						
Abnormal	1	0	0	0	0	2
Borderline	1	0	0	0	0	0

*SDQ indicates Strength and Difficulties Questionnaire; SSNS, steroid-sensitive nephrotic syndrome; SDNS, steroid-dependent nephrotic syndrome; and SRNS, steroid resistant nephrotic syndrome.

Table 7. Behavioral Abnormalities by Number of Relapses in Children With Nephrotic Syndrome*

SDQ Subscale	SSNS, n			SDNS, n			SRNS, n		
	No Relapse	< 5 Relapses	≥ 5 Relapses	No Relapse	< 5 Relapses	≥ 5 Relapses	No Relapse	< 5 Relapses	≥ 5 Relapses
Emotional symptom									
Abnormal	0	2	0	0	2	1	3	2	1
Borderline	1	0	1	0	2	0	0	1	2
Conduct problems									
Abnormal	2	4	0	0	2	1	3	3	1
Borderline	2	3	0	0	2	0	1	1	1
Hyperactivity									
Abnormal	0	1	0	0	1	0	0	2	0
Borderline	1	0	0	0	3	1	0	0	0
Peer relationship problems									
Abnormal	1	2	0	0	2	2	1	2	2
Borderline	3	1	0	0	4	1	1	1	1
Total scale									
Abnormal	1	0	0	0	1	0	0	1	1
Borderline	0	4	0	0	1	2	2	2	0
Prosocial behavior									
Abnormal	0	1	0	0	0	0	2	0	0
Borderline	1	0	0	0	0	0	0	0	0

*SDQ indicates Strength and Difficulties Questionnaire; SSNS, steroid-sensitive nephrotic syndrome; SDNS, steroid-dependent nephrotic syndrome; and SRNS, steroid resistant nephrotic syndrome.

Table 8. Behavioral Abnormalities by Immunosuppressant Use in Children With Nephrotic Syndrome*

SDQ Subscale	SSNS, n		SDNS, n		SRNS, n	
	No Drug	Drug	No Drug	Drug	No Drug	Drug
Emotional symptom						
Abnormal	2	0	0	3	0	6
Borderline	2	0	0	2	0	3
Conduct problems						
Abnormal	6	0	1	2	1	6
Borderline	5	0	0	2	0	3
Hyperactivity						
Abnormal	1	0	0	1	0	2
Borderline	1	0	1	3	0	0
Peer relationship problems						
Abnormal	3	0	0	4	0	5
Borderline	4	0	0	5	0	3
Total scale						
Abnormal	1	0	0	1	0	2
Borderline	4	0	0	3	0	4
Prosocial behavior						
Abnormal	1	0	0	0	0	2
Borderline	1	0	0	0	0	0

*SDQ indicates Strength and Difficulties Questionnaire; SSNS, steroid-sensitive nephrotic syndrome; SDNS, steroid-dependent nephrotic syndrome; and SRNS, steroid resistant nephrotic syndrome.

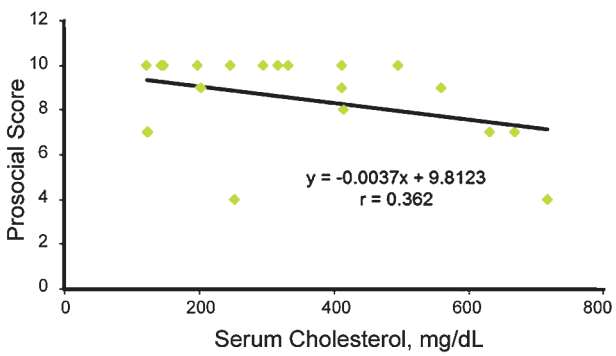

Figure 1. Correlation between serum cholesterol level and prosocial behavior score of children with steroid-resistant nephrotic syndrome.

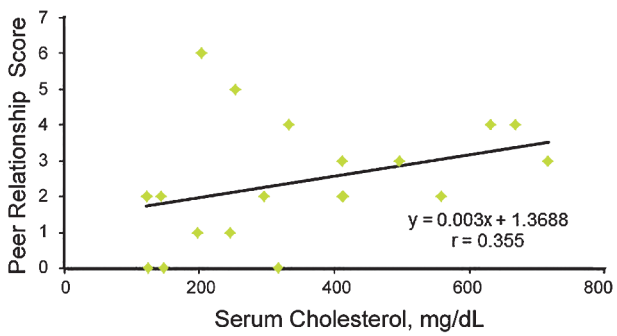

Figure 2. Correlation between serum cholesterol level and peer relationship problems score of children with steroid-resistant nephrotic syndrome.

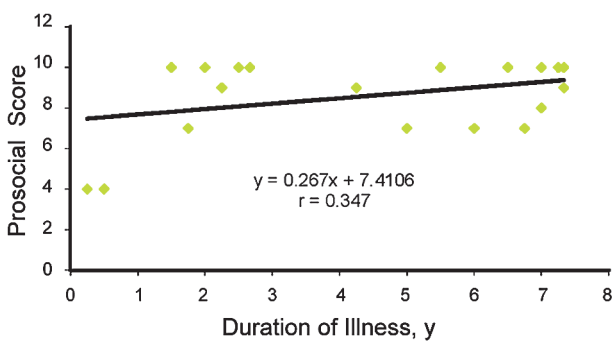

Figure 3. Correlation between duration of illness and prosocial behavior score of children with steroid-resistant nephrotic syndrome.

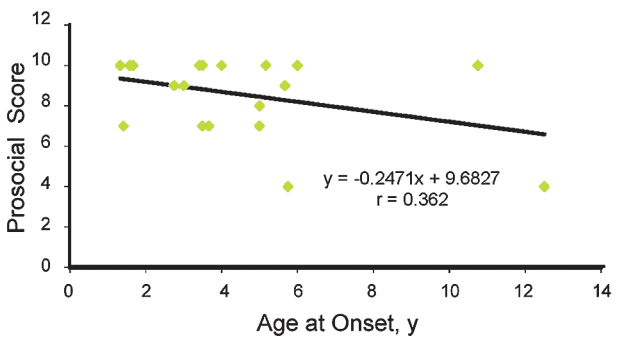

Figure 4. Correlation between age at the onset of nephrotic syndrome and prosocial behavior score of children with steroid-resistant nephrotic syndrome.

DISCUSSION

Any chronic illness has social and behavioral impacts that affect psychosocial development of the child and family coping.[14] The risk of psychopathological disorders is 2.5 times higher in chronic childhood conditions than in the general population.[15] A significant number of chronically affected children suffer from psychological disabilities that may be more serious than the physical illness itself.[16] Responsible factors are interferences with daily functioning and normality of appearance.[14] Parental overconcern may also interrupt schooling and day-to-day activities.[17] Many of these stressors are present in nephrotic children. In addition, prolonged corticosteroid treatment may contribute to behavioral disturbances.[16]

Our study is one of the fewest ones done to evaluate behavioral changes in Egyptian children and also one of the fewest studies done in Egypt to study the psychological aspects of a chronic illness. We found abnormal emotional scores in 11 of 60 patients, abnormal conduct scores in 16, abnormal peer relationship scores in 12, abnormal hyperactivity scores in 4, and abnormal total scores in 4. Abnormal prosocial scores were noticed in 3 patients. Children with SRNS were more likely to have abnormal scores, but the differences did not reach statistical significance. Mehta and colleagues[17] reported that a significant proportion of nephrotic children showed features of depression, hyperactive and aggressive behavior, somatic complaints, social withdrawal, and poor school performance. Similarly, Guha and colleagues[16] demonstrated that a significant proportion of nephrotic children (68%) suffered from behavioral problems. Mishra and coworkers[18] found that even at the time of the first episode of NS, prior to the initial therapy, somatic complaints and withdrawn behavior were common, indicating that untreated disorder per se can cause significant behavioral changes.

In our study, steroid dose, number of relapses, or frequent use of immunosuppressants did not affect psychological scores of the patients. On the contrary, Guha and colleagues[16] demonstrated a significant association between behavioral problems and frequency of relapse. They attributed this association to frequent visits to the clinic, resulting in more absenteeism from school, and isolation from peer groups. They found—in agreement with us—no association between corticosteroids and behavior abnormalities. They attributed that to the moderate to low dose of corticosteroids used. Soliday and associates[3] consistently reported an abnormal behavior among 65% of nephrotic children and that prednisone was a strong predictor of abnormal behavior, especially increased aggression. Patients may also feel irritated by perceiving their parents' continuous overconcern about their health, which often interrupts schooling and day-to-day activities.[19] Furthermore, with extended duration of disease and steroid exposure, patients become increasingly aware of changes in their physical appearance with cushingoid transformation.[20]

Our center is a tertiary public hospital, providing medical service to poor patients who cannot afford investigations and treatment of the disease. We expect that all of our patients are of the same low socio-economic and low income levels, coming from poor governorates according to the Socio-economic Level Questionnaire.[21] Guha and colleagues[16] found that poverty in association with chronicity of disease contributed to very a high prevalence of behavior disturbance.

In our study, there were negative correlations between both age at the onset of NS and serum cholesterol level and prosocial assessment of the SRNS group and a positive correlation between cholesterol level and peer relationship assessment of this group. The high cholesterol level is a marker of poor control of NS and resistance to steroids, so with its elevation, peer relationship abnormalities increase and prosocial abnormalities decrease. There was a positive correlation between the duration of illness and prosocial assessment of the SRNS group and a negative correlation between the age at the onset of NS and prosocial assessment of SRNS group. When comparing the three groups of NS, there were no significant differences in terms of age, weight, height, and duration of illness. Comparable weight and height between SRNS that is associated with more chronic disease and the SSNS and SDNS may be due to the small sample size of each group. However, there was a significant difference in the age at the onset NS (being lowest in SDNS group). Laboratory studies were found to be associated with the type of NS, too. The 24-hour urine proteins, blood urea nitrogen, and serum cholesterol were highest in the SRNS group, while the total serum protein, serum albumin, serum calcium, and GFR were lowest in the SRNS group.

Only 3 patients of our cohort (5%) developed kidney impairment, all of whom had SRNS. Two of these patients reached ESRD (10% of the SRNS group). Kaddah and coworkers[22] reported kidney impairment in 26% of the SRNS patients. Similar to our study, Kari and Halawani[23] reported that 10% of SRNS patients developed ESRD.

CONCLUSIONS

A major limitation of this study was the small sample size. However, we found that emotional symptoms, conduct problems, peer relationship problems, hyperactivity, and the overall poor behavior scores were more likely to be seen in children with SRNS group than other NS treatment status. We recommend that attention to behavioral problems should be given early in the course of disease and parents should be counseled that their child might experience behavioral changes.

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CONFLICT OF INTEREST

None declared.

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