

Chronic kidney disease and emotional-behavioral disorders in adolescents

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Abstract

Background Chronic kidney disease (CKD) is characterized by progressive renal injury with inevitable functional deterioration. This functional loss is usually slow, progressive, and irreversible. Chronic kidney disease profoundly influences the daily routines of pediatric patients and their families, requiring significant psychosocial adaptation by both patients and families.

Objective To assess for potential associations between CKD and emotional/behavioral disorders in adolescents.

Methods This cross-sectional study was done at the Pediatric Nephrology Outpatient Department, Hasan Sadikin Hospital, Bandung, West Java. The consecutive sampling included all patients who fulfilled the following criteria: (1) aged 10-18 years, (2) diagnosed with CKD at least 3 months prior to the study, and (3) whose parents provided informed consent. The Strengths and Difficulties Questionnaire (SDQ) was used to assess emotional/behavioral disorders. Socio-demographic and clinical data were collected from medical records and interviews with parents. Chi-square and Mann-Whitney tests were used in the statistical analyses.

Results A total of 75 subjects with CKD participated in the study. The majority of the subjects were female (53%) and <14 years old (55%). Emotional/behavioral disorders were found in 24 subjects (32%). There were no significant correlations between age, gender, paternal and maternal education level, duration of illness, or treatment with emotional/behavioral problems. However, later stage of CKD was significantly associated with prosocial problems, based on the SDQ assessment.

Conclusion Late stage CKD is significantly associated with prosocial problems of the SDQ scales. [Paediatr Indones. 2019;59:325-30; doi: <http://dx.doi.org/10.14238/pi59.6.2019.325-30>].

Keywords: adolescent; chronic kidney disease; mental-emotional and behavioral disorder

Chronic kidney disease (CKD) is a major, worldwide health problem with increasing incidence and prevalence each year.¹ This disease is characterized by progressive renal injury with inevitable functional deterioration, which is usually slow and irreversible.^{2,3}

The epidemiological data on CKD is very difficult to study, as CKD is underdiagnosed and underreported. The prevalence of CKD in children aged 0-15 years in Southeast Asia was reported to be around 329 cases per 1 million children.² The Dr. Hasan Sadikin Hospital medical records for the period of 2018-2019 showed that 427 children diagnosed with CKD consulted the Pediatric Nephrology Outpatient Department.

Chronic conditions in adolescence can affect the physical, cognitive, social, and emotional spheres of development, with repercussions for siblings and parents.⁴ Chronic kidney disease is a risk factor for psychosocial impairment and psychiatric symptoms. In pediatric population, CKD may negatively impact

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psychosocial development and patient quality of life. Children with CKD often experience significant emotional and behavioral problems, especially those with frequent relapses, steroid dependence, steroid resistance, or limitations in their daily life activities.⁵ On a daily basis, they are submitted to dietetic and fluid restrictions, difficult and invasive treatments, and even hospitalizations. However, these negative impacts still remain unrecognized and underestimated.^{3,5} A study observed that patients with worse emotional and social performance usually demonstrated a tendency to not follow the medical recommendations. Of transplanted kidney patients, 31% reported that they did not follow medical recommendations and 19% reported previous attempts at self-extermination and/or serious suicidal thoughts.⁶

Chronic kidney disease (CKD) studies in the pediatric population have uncovered an elevated frequency of psychiatric disorders, with the most common being adjustment disorders, depressive symptoms, anxiety, and cognitive impairment. However, the association/correlation between clinical or laboratory features, disease duration and severity and psychological variables remains undetermined.³

Optimal management of pediatric CKD should focus on both pharmacological therapy and psychosocial aspects. A multidisciplinary team approach to pediatric CKD is needed, not only to improve clinical outcomes, but also to improve quality of life of these children.⁷

Early identification of emotional and behavior problems is important for early diagnosis and management, in order to improve clinical outcomes and successful transition to adult life. This study aimed to assess for potential associations between CKD factors and emotional/behavioral disorders in adolescents.

Methods

This cross-sectional study was done from July to September 2019 in adolescents with CKD who visited the Pediatric Nephrology Outpatient Department, Hasan Sadikin Hospital, Bandung, West Java, for routine check-ups. The inclusion criteria were patients: (1) aged 10-18 years, (2) diagnosed with CKD at least 3 months prior to the study, and (3) whose parents provided informed consent. Exclusion criteria were

patients who had: (1) renal transplantation, (2) a significant life event unrelated to their kidney disease in the past 3 months, such as losing a family member, severe illness of a family member, family structure changes, and (3) previous diagnosis of intellectual disability. Subjects were asked to answer the SDQ.

The *Strengths and Difficulties Questionnaire* (SDQ) was a screening/assessment tool to identify emotional and behavior problems in pediatric populations. The SDQ consisted of 25 items which were divided between 5 scales: (1) emotional symptoms, (2) conduct problems, (3) hyperactivity/inattention, (4) peer relationship problems, and (5) prosocial behavior. A probable SDQ prediction for any given disorder correctly identified 81-91% of the children who definitely had that diagnosis, it had a sensitivity of 85% and a specificity of 80%.^{8,9} Socio-demographic and clinical data (age, gender, parental education level, duration of illness, CKD etiology, and stage and therapy of CKD) were obtained by parental interviews and medical records.

We evaluated for possible correlations between CKD and emotional/behavioral problems in adolescents by descriptive statistical and bivariate analyses. Continuous data were reported as mean and standard deviation (SD) when appropriate. Non-parametric variables were compared by Mann-Whitney test. Dichotomous variables were compared by Chi-square test. Analyses were carried out using the SPSS statistical package *ver.* 22 software. This study was approved by the Research Ethics Committee of Dr. Hasan Sadikin Hospital.

Results

A total of 75 adolescents with CKD were enrolled in the study. The majority of the subjects were female (59%) and aged less than 14 years (52%). The main baseline clinical and socio-demographic characteristics are summarized in **Table 1**.

The majority of parents had secondary-high school educational level (fathers 56%, mothers 52%). The majority of the subjects had CKD duration of illness for less than 3 years (80%), were at stage I (61%), and received conservative therapy (85%).

The characteristics of emotional/behavior disorders are summarized in **Table 2**. Based on the

Table 1. Characteristics of subjects

Characteristics	(N=75)
Age, n (%)	
< 14 years	39 (52)
> 14 years	36 (48)
Gender, n (%)	
Male	31 (41)
Female	44 (59)
Paternal education level, n (%)	
Elementary school	27 (36)
Secondary – High school	42 (56)
Higher education	6 (8)
Maternal education level, n (%)	
Elementary school	30 (40)
Secondary – High school	39 (52)
Higher education	6 (8)
Duration of CKD, n (%)	
< 3 years	60 (80)
> 3 years	15 (20)
Stage of CKD, n (%)	
I	46 (61)
II	8 (11)
III	4 (5)
IV	3 (4)
V	14 (19)
Treatment, n (%)	
Conservative	64 (85)
Renal replacement (HD/PD)*	11 (15)

HD=hemodialysis; PD=peritoneal dialysis

Table 2. Characteristics of emotional/behavior disorders assessed by SDQ in adolescents with CKD

SDQ parameters	Normal	Abnormal
Prosocial, n (%)	72 (96)	3 (4)
Hyperactivity, n (%)	62 (83)	13(17)
Emotional, n (%)	55 (73)	20 (27)
Conduct, n (%)	61 (81)	14 (19)
Peer relationship, n (%)	65 (87)	10 (13)
SDQ total score interpretation, n(%)	51 (68)	24 (32)

results of SDQ answers, 24 subjects (32%) were identified to have emotional/behavior disorders, with emotional (n=20) and conduct disorders (n=14) having highest prevalences (27% and 19%, respectively). The SDQ total score interpretation were the result of SDQ evaluation, which were evaluated from the SDQ total score of each subject.

Table 3 shows the bivariate analysis results on factors with potential correlations to emotional/behavioral disorders or abnormal SDQ results. In this study, total SDQ score was not correlated with patient

Table 3. Analysis of CKD factors and normal vs. abnormal SDQ results

Variables	SDQ			P value
	Normal	Abnormal	Total	
Age, n (%)				0.627
< 14 years	28 (55)	11 (46)	39 (52)	
> 14 years	23 (45)	13 (54)	36 (48)	
Mean age (SD), years	13.5 (2.1)	13.9 (0.1)		0.405*
Gender, n (%)				0.224
Male	24 (47)	7 (29)	31 (41)	
Female	27 (53)	17 (71)	44 (59)	
Paternal education level, n (%)				0.761
Elementary school	17 (33)	10 (42)	27 (36)	
Secondary – High school	30 (59)	2 (50)	42 (56)	
Higher Education	4 (8)	2 (8)	6 (8)	
Maternal education level, n (%)				0.972
Elementary school	20 (39)	10 (42)	30 (40)	
Secondary – High school	27 (53)	12 (50)	39 (52)	
Higher education	4 (8)	2 (8)	6 (8)	
Duration of CKD, n (%)				0.853
< 3 years	40 (78)	20 (83)	60 (80)	
> 3 years	11 (22)	4 (17)	15 (20)	
Mean duration of CKD (SD), months	25.53 (2.48)	26.92 (2.29)		0.716*
Stage of CKD, n (%)				0.296
I	35 (69)	11 (46)	46 (61)	
II	4 (8)	4 (17)	8 (11)	
III	2 (4)	2 (8)	4 (5)	
IV	1 (2)	2 (8)	3 (4)	
V	9 (18)	5 (21)	14 (19)	
Treatment, n (%)				1.000
Conservative (received steroids)	44 (86)	20 (83)	64 (85)	
Renal replacement (HD/PD)	7 (14)	4 (17)	11 (15)	

HD=hemodialysis; PD=peritoneal dialysis, *Mann-Whitney Test

age, as the proportion of subjects with normal SDQ and abnormal SDQ based on age (<14 years vs. >14 years) were nearly equal (52% vs. 48%; $P=0.627$).

We found no significant correlation between gender and emotional/behavior disorders. Both normal SDQ and abnormal SDQ subject majorities were female. There was also no significant correlation between parental educational level and emotional/behavior disorder, as the majority of both parents graduated from secondary high school. In terms of duration of illness, stage of CKD, and treatment modalities, there were no significant correlations between these CKD characteristics and emotional/behavior disorders.

Table 4 shows the bivariate analysis results on factors with potential correlations to the SDQ scales (prosocial, hyperactivity, emotional, conduct, and peer relationship). The only significant correlation revealed was stage of CKD and the prosocial SDQ scale ($P=0.011$). Adolescents diagnosed with prosocial disorders had mostly stage V CKD or end-stage renal disease.

ones, due to the characteristics of the disease that require continuous readaptation. In addition, the disease affects not only these children's lives, but also the lives of their families. They also have a tendency to negative self-image and feelings of inferiority in relation to their peers.¹⁰

Several hypotheses have been suggested to explain this increase in the prevalence of emotional/behavioral disorders. In addition to the stress inherent to CKD and its treatment, studies have pointed out other factors that contribute to the predisposition to psychiatric disorders in this group. Among them are the decrease in levels of brain-derived neurotrophic factor (BDNF) and the low serum level of serotonin in CKD patients.^{10,11}

Development refers to the process through which human beings typically grow and mature from infancy through adulthood. The different aspects of development that are measured include gross motor, fine motor, speech, cognitive growth, and social growth. Child development is a complex interaction between brain maturation and the organs involved.¹²

Table 4. Analysis of CKD factors and SDQ scales

CKD factors	SDQ scales (P values)					SDQ total
	Prosocial	Hyperactivity	Emotional	Conduct	Peer relationship	
Age	0.944	0.288	0.638	0.469	0.066	0.627
Gender	1.000	0.589	0.684	0.302	0.260	0.224
Paternal educational level	0.852	0.543	0.146	0.990	0.902	0.761
Maternal educational level	0.813	0.363	0.924	0.968	0.587	0.972
Duration of CKD	0.883	0.939	1.000	0.208	1.000	0.853
Stage of CKD	0.011*	0.567	0.428	0.542	0.127	0.296
Treatment	0.077	0.609	1.000	1.000	1.000	1.000

*statistically significant ($P<0.05$)

Discussion

In our study, emotional/behavior disorders were found in 32% of adolescents with CKD. This prevalence was similar to previous studies with mental disorder prevalences ranging from 35.7% to 36.8%.³ The presence of CKD during adolescence significantly increased the risk of emotional and behavioral disorders.³ Children with CKD can present with psychological disorders caused not only by the disease itself, but also by the treatment. These children may have limitations in their daily lives, mainly physical

During the preteen, teenage, and young adult years, young people not only undergo dramatic changes in physical appearance, but also rapid changes in physiological, psychological, and social functioning. Hormonally-driven physiological changes and ongoing neurological development occur in the setting of social structures that foster the transition from childhood to adulthood. This period of development comprises adolescence, which has been divided into 3 phases: early, middle and late adolescence.^{12,13}

The early adolescence period (10-14 years) is characterized by concrete cognitive thoughts,

egocentricity, and inability to perceive long-term outcomes of current decisions. In the middle adolescence period (15-16 years), cognitive thoughts become more mature (emergence of abstract thought), adolescents may perceive future implications but may not apply them to decision-making, and their strong emotions may drive decision-making. The late adolescence period (17-19 years) is characterized by idealism, a future orientation with a sense of perspective, independent thinking, and increased autonomy.^{12,14}

Adolescence is considered to be a difficult period, marked by conflicts in search of one's autonomy, culminating with the redefinition of the individual as one moves towards the introduction of adult life. In patients with CKD, these conflicts are aggravated by the difficulty of managing the disease, feelings of rebellion, and denial of one's physical condition and treatment.¹⁰ In our study, the majority of subjects were ≤ 14 years old (early adolescence) and female. Based on our analysis, age and gender were not associated with emotional/behavior disorders or abnormal SDQ results.

A previous study found a correlation between duration of illness and psychosocial problems in CKD patients. Longer duration of illness was associated with higher psychosocial problem prevalence.⁵ On the other hand, our study found that duration of illness was not significantly correlated with emotional/behavior disorders.

Another study showed a probable association between an increase in height, as well as adequate level of hematocrit and albumin, with better quality of life (QoL) in adolescents with CKD. A decrease in the glomerular filtration rate (GFR) was associated with significant impairment of QoL.¹⁵ We found a significant correlation between stage of CKD and prosocial problem based on SDQ results. Stage of CKD was significantly higher among those presenting with prosocial problems.

Children with renal disease who received steroids may be particularly susceptible to the side effects of steroids. Duration of steroid treatment was found to be significantly related to children's anxiety/depression and externalizing problems. This finding may reflect the effect of extended exposure to steroids on the children's physical appearance (body mass index and height). Moreover, it could be hypothesized that

anxiety/depression problems may be partly induced by steroid effects on brain regions (i.e., hippocampus and amygdala) involved in mood regulation and in which corticosteroid receptors are densely located.^{5,10} In our study, the majority of subjects received steroids and steroid therapy was not significantly correlated with emotional-behavior disorders. The majority subjects in this study were in a state of remission and received low steroid doses.

The limitations of our study were that the screening instrument used was made not for CKD patients, nor did we measure intellectual level (full-scale IQ). Future studies evaluating anthropometric status, laboratory values (hematocrit, albumin, and urea nitrogen level), sexual maturity rate (Tanner stage), as well as duration and dosage of steroids are needed to provide more information on risk factors of emotional-behavior disorders. Longitudinal follow-up of subjects is needed to monitor and evaluate their developmental process.

In conclusion, later stage of CKD has a significant correlation with prosocial problems based on SDQ results. Stage of CKD is significantly higher among those presenting with prosocial problems.

Conflict of interest

None declared.

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