

Quality of Life in Children with Chronic Kidney Disease

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Abstract

Chronic Kidney Disease (CKD) is a serious disease in children with increasing prevalence over the years. Sustained pain and uncertainty for recovery mostly leads to certain mental condition, such as depression and anxiety. This condition also usually affected the caregiver for children with CKD. This study will discuss about the quality of life of children with CKD. The aim of this systematic review is to determine quality of life of children with CKD and factors associated with quality of life of children with CKD. There are 4 studies used for this systematic review study and was conducted through PubMed database. The number of inclusion studies that will be discussed in this study consists of 2 cross-sectional studies, 1 case controls, and 1 descriptive-analytic. A total of 224 children with CKD were involved in all inclusion studies of this study. The results of the analysis of all included studies in this study showed that patients with CKD were found to have impaired quality of life. Children with CKD scored lower than controls on all subscales. ESRD was related to significant morbidity and a poorer QOL. Risk factors for impaired quality of life are age 5-7 years, age 13-18 years, low socioeconomic status, father with low education level, and use of steroids. Children with CKD have impaired quality of life (QoL). Children with CKD have lower quality of life than controls on all subscales in terms of physical, emotional, social, and schooling. The risk factors for decreased quality of life (QoL) in children with CKD are the child's age, low socioeconomic and parental education levels, unexpected parenting patterns, length of illness, and use of steroids.

Keywords: Children; chronic kidney disease; quality of life (QoL).

1. Introduction

Chronic kidney failure (CKF) or chronic kidney disease (CKD) is a serious health issue in children, with a prevalence that is increasing each year (Supriyadi, Wagiyo, & Widowati, 2011). CKD is defined as a disorder of kidney structure or function lasting for more than 3 months (KDIGO, 2017), with or without a decline in glomerular filtration rate (GFR) or mGFR $< 60\text{mL}/\text{min}/1.73\text{m}^2$ for ≥ 3 months. CKD may be accompanied by kidney damage in some cases (National Kidney Foundation, 2002).

Kidney failure was the 27th leading cause of death worldwide in 1990, rising to the 18th position in 2010. Data from the 2013 Basic Health Research (Riskesmas) showed that the prevalence of kidney failure in the Indonesian population was 0.2% or 2 per 1000 people, while the prevalence of kidney stones was 0.6% or 6 per 1000 people. The highest prevalence of kidney failure was in the Central Sulawesi Province at 0.5%. By gender, the prevalence of kidney failure in males (0.3%) was higher than in females (0.2%). Based on educational strata, the highest prevalence of kidney failure was among those who had no formal education (0.4%). Meanwhile, in rural areas (0.3%), the prevalence was higher than in urban areas (0.2%) (Depkes, 2018).

Kidney failure can have physical, mental, and psychological impacts (Bayat et al., 2012). Depression is the most common psychological issue faced by CKD patients. Depression can be influenced by various factors, including a decline in organ function, lifestyle changes, and more. Therefore, a family-centered approach is crucial in managing depression by providing support to the patient. The need for family support and attention persists throughout life, so if patients feel unsupported by their families, they may experience major episodes of depression, such as feelings of low self-esteem, helplessness, and suicidal thoughts (Suryaningsih.M, Kanine E, 2013). Several studies have shown that depression is associated with increased healthcare costs, including primary care, pharmacy, medical inpatient care, psychiatric inpatient care, and outpatient mental healthcare.

Chronic illnesses in children affect all aspects of family life and each family member. Specifically, families with diagnosed children face severe trauma. Experiencing loss of appetite, fatigue, sleep disturbances, weight loss, insomnia symptoms, and suicidal thoughts (Gerogiani & Babatsikou, 2014). Assisting a child through treatment can have a significant and prolonged stressful impact on parents, especially mothers, possibly because mothers spend more time caring for their children. Problems that can trigger stress in mothers include the lengthy treatment duration (approximately 2 years), high treatment costs, and the possibility of a child's death (Jiloha & Bhatia, 2010).

Psychological stress is associated with the onset of a spectrum of diseases. In humans, acute stress activates the sympathetic nervous system (SNS) and the hypothalamic-pituitary-adrenal (HPA) axis. The SNS is activated immediately after stress and enhances unconscious processes needed to cope with challenges, while the HPA axis is activated within minutes and has additional effects that may compensate, enhance, or suppress the effects of the SNS (Chen et al., 2018).

CKD in children is a serious kidney disorder that leads to death and cardiovascular disorders, causing complications such as growth disturbances and psychosocial disorders in children (Clavé et al, 2019). Optimal care and accurate assessment of the health of children with CKD can be achieved if, in addition to classic indicators such as mortality and morbidity, their personal perceptions of their health conditions are also considered, including their quality of life. Quality of life in children with chronic kidney disease is significantly influenced by many factors, including the child's perception of the disease and adaptation to physical, emotional, social, and school environmental changes (Kelly, 2016). Therefore, researchers are interested in exploring the quality of life in children with chronic kidney failure.

2. Methods

This research employed the Systematic Review method to evaluate the quality of life in children with chronic kidney failure. Inclusion criteria encompassed literature discussing this topic, published in peer-reviewed journals, with specific keywords: "Child" AND "Quality of life" AND "CKD." Exclusion criteria excluded literature not meeting these keyword criteria. The study utilized the PubMed database for journal searches, conducted during May-June 2022 at the researcher's residence. Literature selection adhered to Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) and Mixed Appraisal Tool (MMAT) algorithms. Collected and analyzed data were organized in a sheet, covering general information, study characteristics, participant intervention details, and outcomes.

3. Results

3.1. Quality of Life in Children with CKD

In the study by Mckenna et al (2006), which evaluated HRQOL using the Pediatric Inventory of Quality of Life (PedsQL™ Version 4.0), it was found that children with CKD scored lower than the control group in all subscales, including physical, emotional, social, and school aspects. However, only TX compared to the control group showed statistical significance with a P value of 0.0009 ($P < 0.02$). DIAL children scored the same or higher than the TX group in all domains. Significant differences were observed for the social subscale between children with (mean \pm SD = 62.0 \pm 29.0) and without (mean \pm SD = 81.1 \pm 17.6) non-renal comorbidities ($P = 0.008$). Caregivers gave lower scores than patients in all four domains. In terms of physical aspects, children with CRI, DIAL, and TX had average scores of 74.6, 71.6, and 70, respectively. Based on caregiver assessment of their children's physical health, the averages were 62.7, 57, and 61.6, respectively. Emotionally, children had averages of 73.3, 80, and 65.8, while caregivers gave scores of 67, 54.9, and 66.2. Socially, children had averages of 78.3, 77.1, and 77.9, while caregivers gave scores of 68.5, 61.2, and 64.3. In terms of school, children had averages of 62.2, 66.4, and 60, while caregivers gave scores of 58.2, 49.4, and 54.3. In the study by Pardede et al (2019), 19% of 100 NS patients were found to have impaired quality of life.

In the study by Kilicoglu et al (2016), 9 ESRD patients had CDI scores higher than 9. There was a significant difference in mean depression scores, with the highest significance in the dialysis group. Mean state anxiety scores were significantly lower in dialysis patients. The correlation between clinical variables, such as onset age, disease duration, hemoglobin levels, Z scores, depression and anxiety severity levels, was evaluated for patient groups. There was no significant relationship between clinical variables, depression, and anxiety scores. The correlation of psychiatric questionnaire scores and clinical variables with QOL scores was also assessed. CDI, SAI, and TAI scores generally correlated negatively with PedsQL-C and P subscale scores, except for PedsQL-P physical health subscale scores, indicating that higher levels of depression and anxiety symptoms were associated with worse quality of life. High Z scores correlated positively with all PedsQL-C subscale scores. Hemoglobin levels correlated positively only with PedsQL-C physical health subscale scores. Based on regression analysis, trait anxiety was a negative predictor for all PedsQL-C subscales, and depression was a negative predictor for the PedsQL-C psychosocial subscale. State Anxiety was a negative predictor for PedsQL-P psychosocial subscale and total scores.

The results of the study by Moreira et al (2015) indicated that there was no significant correlation between resilience and other psychological scores in CKD patients, while in the control group, resilience correlated negatively with CDI scores ($r = .40.496$, $p = 0.007$). HRQoL scores were significantly lower in the CKD patient group for the global, psychological, educational, and psychosocial dimensions of PedsQL. However, quality of life scores did not differ significantly in the physical dimension. In CKD patients, male gender was associated with social HRQoL impairment ($p = 0.027$; Table 4). Previous psychiatric treatment was associated with worse HRQoL scores. There were no differences in terms of adequate education or study disruption due to illness. There were no differences between global anxiety scores and depression symptoms between CKD children and adolescents and controls. For the SCARED subscale, CKD patients showed higher scores only in the separation anxiety subscale ($p = 0.018$). When subjects were categorized based on cutoff scores for each subscale, CKD children and adolescents showed a higher frequency of clinically significant depression symptoms ($p = 0.04$) compared to controls. On the other hand, clinically significant anxiety was present in both groups. Depression and anxiety symptoms correlated negatively with all HRQoL domains (r values ranged from -0.385 to 0.652 , with p values ranging from 0.001 to 0.043 , and r values ranged from -0.399 to -0.748 , with p values ranging from 0.001 to 0.035). PedsQL in disease duration correlated negatively with psychosocial, psychological, and school domains (r values ranged from -0.444 to 0.586 , with p values ranging

from 0.001 to 0.026) and positively with CDI scores ($r = 0.425$, $p = 0.027$) and SCARED ($r = 0.404$, $p = 0.037$).

3.2. Factors Related to Quality of Life in Children with CKD

In the study by Mckenna et al (2006), HRQOL evaluation was conducted on children and caregivers using the Pediatric Inventory of Quality of Life (PedsQL™ Version 4.0). The study included 64 CKD patients and/or primary caregivers, with 17 patients undergoing dialysis, 20 patients with chronic renal insufficiency (CRI), and 27 patients receiving kidney transplants.

Based on patient demographics, the average age of CRI patients was 13.2 ± 3.5 , dialysis patients were 12.7 ± 3.5 , and kidney transplant patients were 14 ± 2.8 . Female CRI patients numbered 7 (35%), dialysis patients numbered 9 (53%), and kidney transplant patients numbered 9 (33%). CRI patients with special education numbered 7/17 (41.1%), dialysis patients numbered 4/10 (40%), and kidney transplant patients numbered 8/20 (40%).

In the study by Pardede et al (2019), the risk factors for impaired quality of life were ages 5-7 years, ages 13-18 years, low socioeconomic status, fathers with low education levels, and steroid use ($p < 0.05$). Disease duration was related to quality of life based on parent and child reports ($p < 0.05$), as well as child caregiving patterns. Parent reports indicated a relationship between quality of life and children aged 5-7 years with a P value of 0.04 ($P < 0.05$), children aged 13-18 years with a P value of 0.03 ($P < 0.05$), and family income with a P value of 0.03 ($P < 0.05$). There was no significant relationship with child gender ($P = 0.41$), early childhood, elementary, and middle school education levels ($P = 0.18$; 0.31; 0.51), birth order ($P = 0.5$), number of children ($P = 0.65$), child caregiving patterns ($P = 0.47$), education levels of fathers and mothers, father's occupation ($P = 0.53$), and mother's occupation ($P = 0.58$). In child reports, there was a relationship between quality of life and father's education with a P value of 0.0001 ($P < 0.05$), and no significant relationship was found between quality of life and child gender ($P = 0.9$), ages 8-12 years, and 13-18 years ($P = 0.87$; 0.51), and elementary and middle school education ($P = 0.71$; 0.47), birth order ($P = 0.79$), number of children ($P = 0.21$), child caregiving patterns ($P = 0.17$), mother's education, father's occupation ($P = 0.55$), and mother's occupation ($P = 0.17$), and socioeconomic status ($P = 0.48$).

In the study by Kilicoglu et al (2016), 32 patients were included in the study. The average age (\pm S.D.) of the transplant group was 13.8 ± 2.3 years, and the dialysis group was 14.3 ± 2.1 (range, 8-18 years), consisting of 13 (40.6%) males and 19 (59.4%) females. The average duration of renal replacement therapy (RRT) was 5.56 ± 3.71 years. No significant differences were found between patients and controls in terms of age, gender, and parents' education. Among patients, 13 (40.6%) received transplants, 11 (34.4%) received PD, and 8 (25.0%) underwent HD.

In the study by Moreira et al (2015), there were no differences between CKD children and adolescents and control patients in terms of age, gender, and school. In the control group, female children showed more symptoms in the panic subscale ($p = 0.029$).

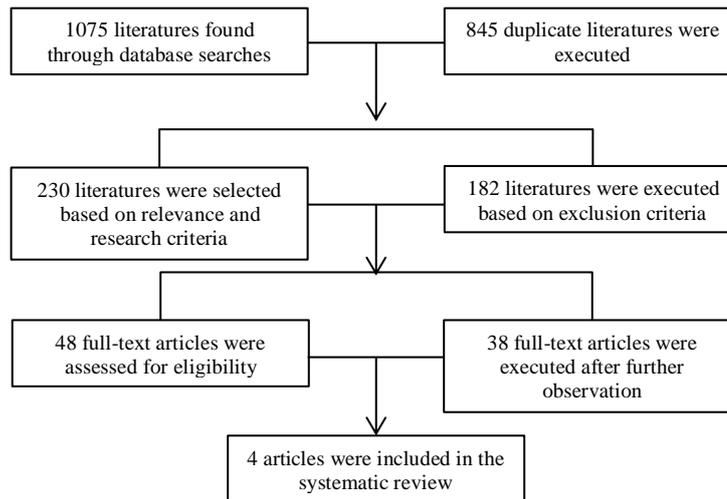


Fig. 1. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Diagram used in the literature search process.

Table 1. Articles used in the systematic review

No	Title and Author	Study Design and Subjects	Variables	Treatment	Outcomes, Results, and Conclusions
1	Quality of Life Children with Chronic Kidney Disease Patient and caregiver Assessment Author: McKenna et al. (2006)	Design: Cross-sectional, observational Subjects: Children aged 2-18 in a Toronto pediatric hospital, patients with CRI, ESRD, maintenance hemodialysis (DIAL), peritoneal dialysis (PD), kidney transplant (TX), caregivers	Control Variable: Healthy children Independent Variables: CRI, DIAL, TX Dependent Variable: Health-Related Quality of Life (HRQOL) - physical, emotional, social, and school domains using PedsQL™ Generic Core Scale	Evaluation of HRQOL using Pediatric Inventory of Quality of Life (PedsQL™ Version 4.0). A 23-question survey assessed patient function in four domains. Scores ranged from 0 to 100, higher scores indicating superior HRQOL.	Outcome: HRQOL in pediatric patients and caregivers Results: Children with CKD scored lower than controls in all domains, significant for TX vs. control (P = 0.0009). DIAL children scored similarly or higher than TX. Significant differences observed in the social domain for children with non-renal comorbidities (P = 0.008). Caregiver scores were lower than patient scores in all domains. Conclusion: Children with CKD rated their HRQOL lower than healthy controls. Caregivers perceived better HRQOL in dialysis patients than expected.
2	Quality of Life of Nephrotic Children	Design: Descriptive analytical, observational	Independent Variables: Age, gender, child's education, birth	QoL examined using PedsQL based on clinical	Outcome: QoL Results: 19% of 100 NS patients had QoL disorders. Risk factors included ages 5-7,

	and Its Related Factors Author: Pardede et al. (2019)	Subjects: Nephrotic Syndrome (NS) patients aged 2-18 in a Jakarta hospital, diagnosed for more than 6 months, without mental retardation or cerebral palsy	order, number of children, parents' education, parents' occupation, parents' income, steroid use Dependent Variable: Quality of Life (QoL)	response and time to diagnosis. Two questionnaires used: PedsQL (parent and child reports) and Parenting Style Questionnaire (KPAA).	13-18, low socioeconomic status, father with low education, and steroid use ($p < 0.05$). Disease duration correlated with QoL based on parent and child reports ($p < 0.05$) and parenting style Conclusion: NS affects QoL in 19% of children. Influencing factors include age, low socioeconomic status, low parental education, unexpected parenting style, disease duration, and steroid use.
3	Impact of End-Stage Renal Disease on Psychological Status and Quality of Life Author: Kilicoglu et al. (2014)	Design: Case-control, observational Subjects: 32 children and adolescents aged 8-18 undergoing Hemodialysis (HD), Peritoneal dialysis (PD), kidney transplantation, caregivers, with CRI, plasma creatinine > 20 mmol/l, ESRD requiring dialysis or kidney transplantation	Independent Variables: Age, gender, race, education, hemoglobin, height z score, ESRD etiology, disease onset age, disease duration Dependent Variables: Pediatric Quality of Life Inventory Parent Version (PedsQL-P), Pediatric Quality of Life Inventory Child Version (PedsQL-C), Child Depression Inventory (CDI), State-Trait Anxiety Inventories for Children (STAI-C)	Questionnaires filled to evaluate psychological status and QoL in patients and healthy controls. Psychological measures using PedsQL-P, PedsQL-C filled by parents and patients. CDI for depression symptoms and STAI-C for anxiety assessment.	Outcome: Psychological status and QoL Results: Significant differences in mean depression scores, lower mean state anxiety scores in patients than controls. Significant differences in QoL between patients and controls. Patients had lower significance values in QoL overall and in psychological, educational, and psychosocial subdomains. Trait anxiety negatively predicted all scales in the Pediatric Quality of Life Inventory 4. Conclusion: ESRD significantly correlates with morbidity and poor QoL. Assessment, improved QoL, and comorbid psychiatric disorders in ESRD should be part of disease management.
4	Anxiety, Depression, Resilience and Quality of Life in Children	Design: Cross-sectional, observational Subjects: 28 pre-dialysis	Independent Variables: Demographic and clinical data, CKD etiology, CKD stage	Psychometric instruments completed by CKD patients, controls, and their parents	Outcome: QoL in CKD patients Results: CKD patients referred more to mental health consultants. Higher scores for separation anxiety and

and Adolescents with Pre-Dialysis Chronic Kidney Disease Author: Moreira et al. (2015)	pediatric CKD patients (stage 1-4), 28 healthy controls	Dependent Variables: Wagnild and Young Resilience Scale, PedsQL, CDI, Self-Report for Childhood Anxiety-Related Disorder (SCARED)	for anxiety, depression, HRQoL, and resilience evaluation. Medical visits scheduled every 3 months.	clinically significant depressive symptoms in CKD patients. Lower overall QoL scores and worse scores for psychological, educational, and psychosocial subdomains in CKD patients. Negative correlation between anxiety, depressive symptoms, and all QoL domains. Resilience was the same in both groups but lower in patients with significant depressive symptoms. No significant correlation between clinical or laboratory findings and psychological variables in CKD patients Conclusion: CKD negatively impacts the QoL of pediatric patients, contributing to higher frequencies of depression and anxiety.
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4. Discussion

4.1. Quality of Life in Children with CKD

The study by Mckenna et al. (2006) reveals that children with chronic kidney disease (CKD) have lower health-related quality of life (HRQOL) compared to healthy children, with dialysis patients exhibiting higher emotional and school scores than transplanted children. Parents perceive their children's HRQOL as lower than the patients themselves, especially for parents of dialysis patients. This study emphasizes the need to address the potential discrepancy in the perception of HRQOL between parents and children. PedsQL™ was chosen for its validity and ease of use in assessing HRQOL across various pediatric chronic diseases.

In Pardede et al.'s study (2019), 19% of patients with nephrotic syndrome were found to have quality of life (QoL) disorders based on both parent and child reports. The duration of the disease significantly correlates with a lower QoL, indicating that longer disease duration may lead to increased illness-related challenges. The study suggests the importance of further research using more comprehensive methods and larger sample sizes to gain a representative understanding of the patterns observed in this study.

The research by Klicoglu et al. (2016) indicates that end-stage renal disease (ESRD) is associated with higher depression symptoms in dialysis patients, while transplant patients have lower anxiety compared to dialysis and healthy control groups. It emphasizes the negative impact of ESRD on quality of life, especially in dialysis patients. Additionally, psychological factors such as anxiety and depression are identified as significant contributors to the deterioration of quality of life in pediatric ESRD patients.

Morreira et al. (2015) highlight that children and adolescents with CKD have lower HRQOL scores compared to controls, and depression is one of the most frequent psychiatric disorders in ESRD patients. Separation anxiety, prevalent in 22% of adolescents with CKD, raises concerns about autonomy and social

functioning. Resilience is identified as a protective factor against psychiatric comorbidities, emphasizing the importance of considering psychological well-being alongside clinical measures.

Pardede et al.'s (2019) study on factors associated with QoL in CKD children indicates that age, socio-economic status, and parental education significantly influence QoL. Adolescents face challenges related to stigma and autonomy, affecting various aspects of their lives. The study underscores the role of family-related factors, such as total family income and child-rearing patterns, in determining QoL in children with CKD. Multivariate analysis highlights low father's education, child-rearing patterns, and low total family income as risk factors for QoL disorders in CKD children.

4.2. Quality of Life in Children with CKD

The dominance of female caregivers is rooted in the socio-cultural role of women as primary caregivers within families, particularly evident in caring for children with chronic kidney disease (GGK). Mothers, assuming the primary caregiving role, bear greater responsibility, often being the sole caretaker during hospital visits and day-long stays with the child, in addition to other caregiving tasks (Lima et al., 2018).

Financial challenges prevalent in families with GGK children result from economic reliance on fathers with minimal education and income. Meanwhile, mothers struggle to contribute due to time constraints. Family income, often derived from social assistance, can lead to caregiver stress and marital issues (Lima et al., 2018). Financial struggles due to chronic illness care and insufficient income hinder active patient engagement. Factors like ineligibility for government aid, comorbidities, healthcare flexibility, and awareness contribute to exacerbated financial conditions. Patients with multiple medications, diverse cultural backgrounds, or unemployed parents face severe financial difficulties, impacting chronic disease management. A global correlation between low socioeconomic status and poor health, with an increased risk of mortality in chronic diseases, is evident. Yet, this may differ in high-income countries with publicly funded healthcare (Jeon et al., 2009).

Child age varies in GGK studies, with no significant differences in difficulties or stress observed among different age groups. Wardhani et al.'s 2022 research on children with hemophilia A revealed age-related disturbances in family and school sports dimensions, emphasizing the varied impact across age groups (Wardhani et al., 2022).

Factors burdening caregivers include the quantity of medication, hospital visits, complex procedures, children relying heavily on caregivers, and reduced social support (Lima et al., 2018).

Education isn't significantly linked to care quality, but higher-educated mothers report lower burden indices, suggesting increased confidence in caregiving. Education influences perceptions of stress, enhances problem-solving and mental flexibility, positively impacting caregivers' quality of life (Lima et al., 2018). Education correlates with behavioral risk factors affecting chronic conditions. It empowers individuals to make healthier choices, seek better healthcare, and navigate complex systems. Education also intersects with income, influencing healthcare access and mortality. Higher-educated individuals generally have jobs with health benefits and better access to healthcare. Education's impact on disease prevention complements income's role in managing health issues. Their effects on disease prognosis are intertwined (Choi et al., 2011).

5. Conclusion

Based on the results obtained in this study, it can be concluded that children with Chronic Kidney Disease (CKD) experience a disruption in their quality of life (QoL). Children with CKD scored lower in the quality of

life compared to the control group in all subscales, considering physical, emotional, social, and school aspects. Risk factors for the decline in quality of life (QoL) in children with CKD include the child's age, low socioeconomic status, low parental education level, unexpected child-rearing patterns, duration of illness, and the use of steroids.

6. Recommendations

Considering the results and limitations of this study, the researchers suggest the following: 1. Further research should be conducted using methods that can more accurately depict the actual conditions, such as cohort or prospective studies, and utilizing more primary data on potentially related risk factors for more accurate analyses. 2. Advanced studies on a larger scale are deemed necessary to obtain a more representative overview of the patterns investigated in this study. 3. Psychoeducation and increased awareness of the psychological conditions and quality of life of children in CKD care programs are necessary to enhance their quality of life.

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