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REVIEW

Financial Toxicity and Kidney Disease in Children and Adults: A Scoping Review

Rossella Siligato[1,2], Guido Gembillo[2,3], Alfredo De Giorgi[4], Alessio Di Maria[1], Laura Maria Scichilone[1], Matteo Capone[1,5], Francesca Maria Vinci[1,5], Simone Nicoletti[1], Marta Bondanelli[5], Cristina Malaventura[5], Alda Storari[1,5], Domenico Santoro[3], Sara Dionisi[6], Fabio Fabbian[1,5]

[1]Nephrology Unit, University Hospital of Ferrara, Ferrara, Italy; [2]Department of Biomedical, Dental, Morphological and Functional Imaging Sciences, University of Messina, Messina, Italy; [3]Unit of Nephrology and Dialysis, Department of Clinical and Experimental Medicine, University of Messina, Messina, Italy; [4]Internal Medicine, University Hospital of Ferrara, Ferrara, Italy; [5]Department of Medical Sciences, University of Ferrara, Ferrara, Italy; [6]Nursing, Technical and Rehabilitation, Department DATeR Azienda Unità Sanitaria Locale Di Bologna, Bologna, Italy

Correspondence: Fabio Fabbian, Department of Medical Sciences, via Luigi Borsari, 46, Ferrara, Italy, I-44124, Tel +39 0532 239385, Email f.fabbian@ospfe.it

Purpose: Social determinants of health have been related with kidney diseases and their outcomes. Financial toxicity (FT) refers to the negative impact of health care costs on clinical conditions. This scoping review aimed to evaluate the literature linking FT with renal diseases.

Patients and Methods: We Included all studies analyzing FT and renal disease recorded in PubMed, Embase and Google Scholar between 2013 and 2023. The research question was formulated with reference to the acronym PCC (Problem, Concept and Contest). For each included study, we considered the study design, the population and main results from different populations with distinct renal conditions and the results were summarized in four tables.

Results: Socioeconomic deprivation was the main cause of FT, and the majority of studies on the relationship between FT and chronic kidney disease (CKD) were conducted in the USA (4 studies evaluated the pediatric population and 6 studies included adults). Three studies reported the impact of FT on nephrolithiasis, and 3 studies analyzed the link between FT and renal tumors. The methods used for detecting FT differed and were based on consultations, questionnaires, expenditures and database records analysis. The COmprehensive Score for financial Toxicity (COST) questionnaire was used in 7 studies (43%), and the prevalence of FT was reported to be high in children and adults.

Conclusion: Although the quality of the selected study is limited, due to different populations investigated and heterogeneity in detecting FT, the latter seems to be a frequent finding in people with renal disease. Health care professionals should recognize socioeconomic deprivation as the major cause of FT. Detecting FT could help in prioritizing patient-centered care in populations with renal diseases through the development of strategies aimed at improving care for people with kidney diseases.

Plain Language Summary: Social determinants of health, especially poverty, social environmental stressors and psychological factors, are increasingly recognized as significant determinants of kidney diseases and their outcomes. Financial toxicity (FT) refers to the negative impact of health care costs on clinical conditions. The relationship between FT and renal disease is not completely understood. With this scoping review, we evaluated all published papers between 2013 and 2023 on this item. We analyzed 16 studies and found that FT is common in pediatric and adult CKD patients and in patients with nephrolithiasis and renal tumors. For patients with kidney disease, FT represents a significant burden, both through the direct costs of disease management and treatment and through indirect costs such as the loss of income due to missed work and expenses for transportation and accommodations near outpatient clinics. Finally, it should be noted that in different countries, it is difficult for people with kidney disease to obtain health insurance coverage. Health care professionals need to improve their knowledge about the relationship between FT and renal disease; there is a paucity of data regarding the effects of FT on different outcomes, although this nonmedical risk factor can negatively influence kidney health and quality of life. Further studies involving different professionals able to consider environmental, physical and emotional risk factors are needed.

Keywords: financial toxicity, financial burden, financial hardship, renal disease, chronic kidney disease

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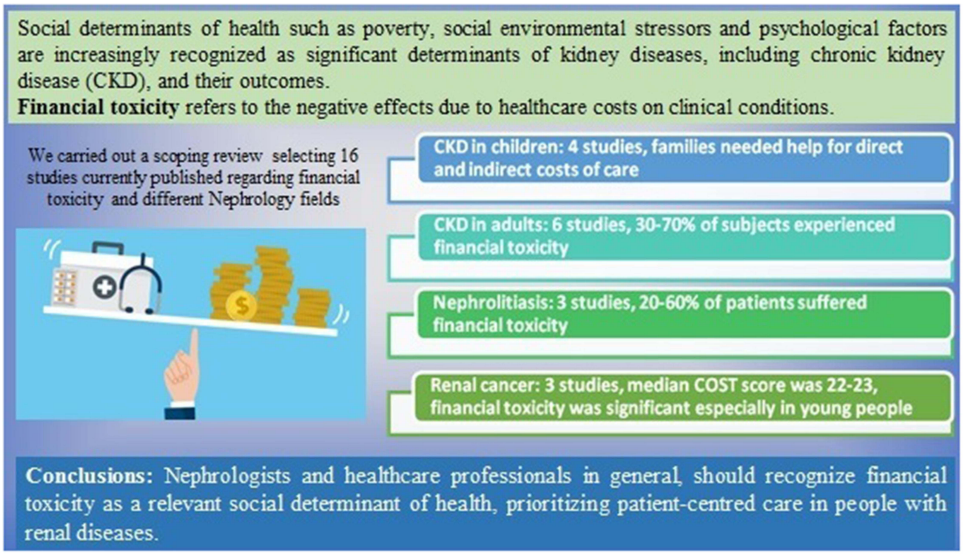
Graphical Abstract



Introduction

The amount of money that patients with chronic kidney disease (CKD) have to pay out of pocket for prescriptions is overwhelming.[1] Social determinants of health (SDoH), particularly poverty, are increasingly recognized as significant,[2] and social environmental stressors and psychological factors impact kidney disease.[3] Financial toxicity (FT) specifically refers to the negative impact of health care costs on clinical status, and its impact on people fighting cancer has been documented.[4–6] Clinical treatment is expensive not only in the case of cancer but also in other chronic diseases, such as cardiovascular disease.[7–9] FT is related to patient adherence, and nonelderly people (aged 18–64 years) with a cancer diagnosis are more likely to report changing their medication regimen for financial reasons.[10] Financial problems are reportedly related to physical health, mental health, satisfaction with social activities and relationships, and decreased quality of life.[11] The link between FT and good health can be viewed as a vicious cycle.[12]

Financial impacts can be significant and mediated through two mechanisms:

i) the direct out-of-pocket costs of care; and
ii) the indirect impact on a patient's ability to earn an income.[13]

A recent systematic review and meta-analysis of 22 studies investigated 13025 subjects aged 60.1 years, in which authors collected data on sex, ethnicity, marital status, employment status, education level, health insurance, cancer type and stage, treatment and survey instrument. Authors reported that the pooled prevalence of FT was 45% (95% CI: 38% to 53%), and the potential risk factors included low income, higher annual expenditure, younger age, unmarried status, unemployed status, nonwhite ethnicity, a lack of private insurance, advanced-stage cancer status and a recent cancer diagnosis.[14] Patients experience FT in three areas: economic hardship, which affects their material conditions; their psychological response; and their health-related coping behaviours.[15] The prevalence of anxiety disorders and symptoms is high among individuals with CKD, and depression, low plasma parathyroid hormone levels, comorbidities, a longer length of hospital stay, and reduced quality of life and vitality are associated with anxiety.[16] Moreover, depression is a frequent condition detected at different stages of CKD.[17] Anxiety and depression can even worsen in the presence of FT.

The increasing impact of socioeconomic conditions on cancer patient outcomes can be summarized using the COmprehensive Score for financial Toxicity (COST), which has 11 items and has been validated.[18,19] The COST score has been associated with income and psychosocial distress. Race, employment status, income, the number of inpatient admissions and psychological distress have all been independently associated with FT.[19]

The increasing prevalence of CKD worldwide will make it the fifth most common chronic disease by 2040.[20] This figure is worrying because the cost of renal replacement therapy (RRT), which includes both dialysis and transplantation, is one of the highest expenditures in hospital-based health care.[21] The cost of treating CKD is distributed differently around the world, depending on local income and the national health organization. A recent study concluded that noncommunicable diseases place a significant financial burden on health budgets and the well-being of nations, which is likely to increase over time.[22] People with renal disease are frequently hospitalized for general, noncardiovascular and cardiovascular reasons. All-cause, noncardiovascular, and cardiovascular hospital admissions have been related to the degree of proteinuria, hypertension, the concomitant presence of diabetes and a low glomerular filtration rate in individuals with CKD.[23]

Nephrolithiasis and nephrolithiasis-related comorbidities such as urinary tract infections cause renal parenchymal damage and are associated with CKD and uremia independent of other known CKD risk factors.[24,25] The relationship between FT and nephrolithiasis is indirect but significant, primarily related to the economic burden of managing the condition. Diagnostic costs due to imaging studies such as CT scans and ultrasounds, treatment costs due to interventions like lithotripsy, ureteroscopy, or even surgery, and chronic management due to medications, dietary modifications, and frequent follow-ups impact out-of-pocket expenses and decrease productivity (missed workdays). Moreover, the financial burden can exacerbate stress, which may reduce overall health and potentially affect stone recurrence indirectly. Patients suffering of stone show signs of financial burden from health care bills even before surgical interventions, displaying a poor understanding of the costs they acquire.[26]

Few studies have examined the impact of financial burden on the various clinical manifestations of kidney disease, particularly from the patient's perspective. Due to the scant data relating FT and kidney diseases, we conducted a scoping review with the aim of revealing actual worldwide knowledge about this relationship.

Materials and Methods

We performed this scoping review according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) statement[27] and based on the guidelines of the Joanna Briggs Institute.[28] We formulated the aim and research question with reference to the acronym PCC (Problem, Concept and Contest), as shown in Table 1. The research question was "What is the main knowledge about the relationship between FT and renal disease in the literature?". The aim of this review was to evaluate the literature to determine the main features of the relationship between FT and renal disease.

All investigations published in English, in which participants had renal disease, especially if the focus was on people with CKD, were considered suitable for inclusion. All studies analyzing FT in patients with renal disease were considered eligible for inclusion. The context was deliberately kept broad, in line with the objectives of the review, with studies related to any setting deemed eligible. All types of primary qualitative or quantitative studies were considered eligible. We considered a period of time included between 2013 and 2023.

Studies aimed at populations with diseases other than CKD were excluded; therefore, all studies analyzing FT in patients with diseases other than renal disease were excluded. In addition, we excluded secondary studies such as grey literature, dissertations and conference papers.

Table 1 PCC Framework

Problem	**Patients with renal disease**
Concept	Financial toxicity
Contest	Any setting

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The acronym PCC was used as a reference to construct the search string (Table 1). Two independent reviewers developed the search strategy. The keywords were combined using the Boolean operators "AND" and "OR". The search was conducted in the following databases: PubMed, Embase and Google Scholar.

Two authors (RS, GG) independently screened articles according to the inclusion and exclusion criteria, and any discrepancies were resolved by a third author (FF). The results obtained from the different databases were analyzed on the basis of the defined inclusion and exclusion criteria and duplicate publications were excluded. Relevant studies were selected through a first screening phase based on title and abstract analysis, and then a second selection (eligibility) phase based on full-text analysis was conducted. Qualitative studies were included in order to highlight the themes associated with FT, moreover, being the concept of FT is relatively new the risk of bias is high due to problems with the comparability of participants or populations in a study, factors other than the FT that influence the results of the study, problems with measurement or classification of FT and missing information.

For each included study, the following data were extracted: first author, country in which the study was conducted, year of publication, study design, population and main results. In addition, several tables were created to summarize the main characteristics of the included studies according to the macro categories in the results.

Detection and quantification of FT in patients with renal disease highlight the negative impact of poverty, social environmental stressors and psychological factors as significant determinants of kidney diseases and their outcomes.

Results

This scoping review included 16 studies reporting different aspects of FT in patients with renal disease, including CKD. The results obtained were divided into four macro categories of interest.

Financial Toxicity and Chronic Kidney Disease in Children

Four studies conducted in different countries were identified: Poland,[29] Egypt,[30] the USA[31] and Australia.[32] The latter was a qualitative study, while the first three were cross-sectional studies. The mean age of the children in the Polish and the Egyptian study was 10.9±4.9 and 11.9±93.9 years respectively, whilst the median age of children in the American one was 4 years, confirming that all studies dealt with parents' financial hardship. The authors studied children with different degrees of severity of kidney disease by asking their parents to complete questionnaires. Parental financial burden was associated with low quality of life. One of the studies examined children who had Wilms tumors and examined the main characteristics of families who sought economic support through crowdfunding campaigns.[31] The main characteristics of the four studies (first author, country in which the study was conducted, year of publication, study design, population and main findings) are listed in Table 2.

Financial Toxicity and Chronic Kidney Disease in Adults

We identified six studies: one conducted in Australia,[33] one conducted in Thailand,[34] one conducted in Brazil[35] and three conducted in the USA.[36–38] Five studies were cross-sectional, and one was longitudinal. A total of 7221 patients, 13.6% (n=989) of whom were on dialysis, were analyzed. Remarkably, only 0.3% (n=25) of the patients were transplant recipients. FT was detected in 30–60% of the patients, and a greater proportion of patients receiving renal replacement therapy were determined to have FT. The main characteristics of the six studies are listed in Table 3.

Financial Toxicity and Nephrolithiasis

Three studies conducted in the USA were identified.[39–41] All studies were cross-sectional and used the COST questionnaire. The authors studied 1283 patients, and FT was identified in 20–60% of them (Table 4).

Financial Toxicity and Renal Tumors

Three studies were found, all of which were conducted in the USA.[42–44] All studies were surveys using the COST questionnaire, assessing a total of 898 patients. FT was a common finding, affecting 15–23% of the patients. The main characteristics of the papers are listed in Table 5.

Table 2 FT and CKD in Children. First Author, Country in Which the Study Was Conducted, year of Publication, Study Design, Population and Main Findings of the Three Studies are Shown

Author/ Country/Year	Type of study/Investigative method	Population	Main findings
Kiliś-Pstrusińska[29] Poland 2014	Cross-sectional. Questionnaires filled by both parents were present, concerning social-demographic parameters and assessment of changes in families after CKD diagnosis in their child.	203 children with CKD and 388 their parent-proxies.	Need of education help for children. Parents perceived the change of the income, social isolation, and difficulties during communications with health care professionals.
Darwish[30] Egypt 2020	Cross-sectional. Caregivers of children with CKD were interviewed using the Pediatric Quality of Life inventory for assessing family impact and economic burden.	250 caregivers of children with CKD (85.6% of children undergoing conservative treatment and 14.4% hemodialysis).	76% of caregivers paid for treatment through both health insurance and out-of-pocket. 60% of caregivers reported having important financial toxicity because of their children's disease. Quality of life was low.
Leraas[31] USA 2023	Cross-sectional. Web Scraping algorithm to identify crowdfunding campaigns on GoFundMe.com for pediatric patients with Wilms tumour in the USA, to describe the features of families seeking economic support.	603 children affected by Wilms Tumor with an associated crowdfunding campaign. 68.5% had two-parent households, 35.5% had siblings.	Successful campaigns requested less money, received more money and solicited larger donor numbers. 52.2% of families experienced loss of employment, 9.8% expressed the need for childcare for other children, 80.9% needed help for direct costs of care, 56.2% needed help for indirect costs associated with seeking care, 6.8% needed help for relocation to pursue complex cancer care.
Medway[32] Australia 2015	Face-to-face semi structured interviews.	27 parents of 26 children with CKD participated.	5 themes were identified: loss of freedom and control, burden of sole responsibility, adapting for survival, instability of circumstances, and struggle in seeking support.

Abbreviations: CKD, chronic kidney disease; FT, financial toxicity.

Table 3 FT and CKD in Adults. First Author, Country in Which the Study Was Conducted, year of Publication, Study Design, Population and Main Findings of the Three Studies are Shown

Author/ Country/ Year	Type of study/Investigative method	Population	Main findings
Essue[33] Australia 2013	Cross-sectional. A questionnaire developed by authors was mailed to participants.	23 individuals on conservative treatment, 199 participants on dialysis (70 at home and 129 in a community center), 25 transplant recipients.	57% of families reported FT and 71% experienced financial catastrophe (out-of-pocket expenses exceeding 10% of household income). FT was associated with CKD and receiving government support. On the contrary, home ownership, access to financial resources and quality of life reduced the likelihood of FT.

(*Continued*)

Table 3 (Continued).

Author/ Country/ Year	Type of study/Investigative method	Population	Main findings
Sangthawan[34] Thailand 2022	Cross-sectional. FT was defined by catastrophic health expenditure (patient's health care costs were at least 40% of the household capacity of pay).	648 patients on conservative treatment, 319 subjects on hemodialysis, 257 participants were on peritoneal dialysis.	FT had higher prevalence in hemodialysis than in peritoneal dialysis patients or individuals on conservative treatment. Both medical and non-medical costs contributed to increased out-of-pocket expenses.
Silva[35] Brazil 2023	Cross-sectional. Participants were surveyed using the COST tool.	214 hemodialysis patients, 54.67% male, 52.80% aged ≥ 60 years, 53.52% were married or in a consensual union, 54.67% had less than nine years of schooling, 24.0% of the sample declared a monthly family income between 1 and 2 minimum wages.	71% had some degree of FT, 48% mild FT degree, 23% moderate degree, 0.46% high degree, and only 29% had no FT degree. Lower income and females were more likely to have some degree of FT related to CKD and need for hemodialysis.
Ozieh[36] USA 2021	Authors used 5 cycles of the NHANES data between 2005 and 2014. Authors evaluated SDoH investigating -family income to poverty ratio -food insecurity -depression (by Patient Health Questionnaire).	1376 adults with CKD.	Poverty was detected in 30.6% of patients, food insecurity in 16.1% and depression in 32.6% of cases. Adverse SDoH was calculated in 53.4% of the investigated population, and it was associated with mortality.
Corwin[37] USA 2021	Longitudinal study, the outcome was DKD development. FT was defined on the basis of: -difficulty paying bills -food insecurity -cost-related medication non-adherence.	2735 adults with diabetes.	FT was detected in 39.7% of participants and they were more likely to be female, belonging to ethnic minority, less educated and with low household income. Incident DKD, developed by 13% of patients, was higher in subjects suffering FT.
Acquah[38] USA 2021	Cross-sectional. Authors used data from the 2014–2018 National Health Interview Survey. The survey consists of 4 core questionnaires: -the household composition -the family core -the sample adult core -the sample child core Detection of FT was based on having problems paying bills.	1425 CKD patients, 50% of whom live within a low income household and 12.3% uninsured.	FT was found in 46.9% of cases and its prevalence was higher in uninsured participants from low income households. People suffering FT were older, non-Hispanic White females, belonging to larger families, uninsured, with suboptimal cardiovascular risk profile and high comorbidity. Consequences of FT were cost-related medication non-adherence and delayed/ forgone medical care.

Abbreviations: CKD, chronic kidney disease; COST, COmprehensive Score for financial Toxicity; DKD, diabetic kidney disease; FT, financial toxicity; NHANES, National Health and Nutrition Examination Survey; SDoH, social determinants of health.

Parameters for Assessing FT

To assess FT, it is important to evaluate how economic hardship affects an individual's material conditions, their psychological response to a lack of resources, and their health-related coping behaviours.[15] The COST questionnaire was used in 7 out of the 16 studies (43%). The COST questionnaire, which was developed in the United States and has 11

Table 4 FT and Nephrolithiasis. First Author, Country in Which the Study Was Conducted, year of Publication, Study Design, Population and Main Findings of the Three Studies are Shown

Author/ Country/ Year	Type of study/Investigative method	Population	Main findings
Green[39] USA 2022	Cross-sectional. Participants were surveyed using the COST tool.	241 subjects.	60% of participants reported moderate FT showing cost-coping strategies such as medication rationing. 26% had severe FT demonstrating worse health outcomes.
Cabo[40] USA 2023	Cross-sectional. A computer-based survey queried stone event history and related costs for medical care, disease-specific quality of life (WISQOL), and an 11-item measure of stone-related financial toxicity (COST-11 score).	942 adults with kidney stone disease from the general population.	Prevalence of FT was 24.7%, determining more out-of-pocket on stone-treatment and delay of the recommended treatment. FT was associated with poorer disease-specific health-related quality of life. Female gender, Medicaid compared to private insurance, and stone passage in the previous year were independently associated with FT.
Setia[41] USA 2023	Cross-sectional. Participants were surveyed using the COST tool.	100 outpatients attending a urology clinic.	19% had high FT. FT was associated with household income, insurance status, education level, number of lifetime and 3-year stone events/surgeries on univariate analysis. Higher household income was independently associated with lower odds of FT.

Abbreviations: COST, COmprehensive Score for financial Toxicity; FT, financial toxicity; WISQOL, Wisconsin Stone Quality of Life questionnaire.

Table 5 FT and Renal Cancer. First Author, Country in Which the Study Was Conducted, year of Publication, Study Design, Population and Main Findings of the Three Studies are Shown

Author/Country/ Year	Type of study/ Investigative method	Population	Main findings
Staehler[42] USA and Germany 2021	Cross-sectional. Participants were surveyed using the COST tool during COVID-19 pandemic.	539 subjects.	23% of individuals had financial difficulties. Female sex, younger age, living in urban areas, lower educational level, high anxiety, metastatic disease and distress due to cancer progression were correlated with low COST score.
Staehler[43] USA and Germany 2023	Cross-sectional. Participants were surveyed using the COST tool.	289 patients aged 61 years with renal cell carcinoma; 91% were white and 96.8% were living in the USA.	Significant financial, medical, behavioural, psychological and emotional hardship was detected in 15%, 26%, 12%, 19% and 24% of cases respectively. Median COST score was 22 (range 4–36) and it was related to distress, time since diagnosis and supplements intake.
Mendhiratta[44] USA 2022	Cross-sectional. Participants were surveyed using the COST tool and qualitative analysis was carried out.	70 subjects with benign renal masses.	Median COST score was 24 and FT was significant especially in young people. Lack of discussion by the provider of the likelihood of benign disease, post-operative complications and financial burden were common themes reported.

Abbreviations: COST, COmprehensive Score for financial Toxicity; FT, financial toxicity.

items, can reveal the increasing influence of socioeconomic conditions on cancer patients' outcomes.[18,19] The questionnaire was developed by conducting a literature review, analyzing patient quality of life, identifying correlations to identify redundancy and statistically unrelated content, and performing exploratory factor analysis.[18]

Themes Emerging From Selected Paper

Common themes related with FT across studies involving children are: the need to organize education, income and employment of parents, costs of care, need for support, social isolation of the family, and quality of life. Moreover, the themes emerged from evaluation of papers analyzing adult populations are not very different and the following: household income, costs of care, presence and type of health insurance, need for support, psychological and emotional hardship, and quality of life.

Discussion

In this review, we analyzed 16 studies and found that FT is common in pediatric[29–32] and adult CKD patients[33–38] and in patients with nephrolithiasis[39–41] and renal tumors.[42–44] As previously reported, FT refers to the negative impact that health care costs can have on a patient's financial well-being. For patients with kidney disease, FT represents a significant burden, both through the direct costs of disease management and treatment and through indirect costs such as the loss of income due to missed work and expenses for transportation and accommodations near outpatient clinics. Finally, it should be noted that in different countries, it is difficult for people with kidney disease to obtain health insurance coverage.

Most of the included studies were cross-sectional and based on interviews, questionnaires, expenditures, and database records analysis. The heterogeneity among the studies was high, and they were difficult to compare due to different study designs. The prevalence of FT appears to be independent of the degree of kidney function impairment, as it also occurs in people with nephrolithiasis and patients with renal tumors who have normal kidney function. Parents of children with CKD reported financial and social difficulties and reduced quality of life. Income and expenses were the major determinants of FT in adults with renal disease. Moreover, a study conducted in the USA defined people with FT as being older, non-Hispanic white females who belong to large families, are uninsured and have a high cardiovascular disease risk and comorbidities.[38] Monetary problems were also detected in individuals with nephrolithiasis and young people diagnosed with renal cancer. Renal diseases and CKD are noncommunicable illnesses of global public health concern.[45]

Although it has been reported that individuals with cancer are at higher risk of developing FT than individuals with different conditions, Kim et al[46] assessed general financial strain as well as FT attributable to treatment, physical quality of life, and emotional quality of life in individuals with chronic obstructive pulmonary disease, heart failure, or kidney failure by a cross-sectional online survey. Financial strain was detected in 62.2% of the total sample, especially if patients were younger, unmarried, with recent diagnosis, or without a bachelor's degree. FT was highlighted in 34.7% of the total population, in participants who were younger, female, unmarried, or without a bachelor's degree.[46] The above-mentioned data confirm that sociodemographic characteristics and chronic illnesses including CKD are associated with FT. The global prevalence of CKD has increased due to the ageing population.[47] The prevalence of undiagnosed CKD is also increasing, particularly among older people, indicating opportunities to improve the diagnosis of the disease.[48] Recently, socioeconomic status, education level, race and sex were found to be consistently associated with awareness of CKD,[49] and awareness of a disease implies attention to costs. In fact, income and expenses were recognized as problems in almost all studies focusing on FT and kidney disease.

In the United States cardiovascular disease is a major cause of FT if SDoH such as economic instability, low education, food poverty, neighborhood conditions, and low social context are present.[50] On the other hand, SDoH defined on the basis of social and community context, health care access and quality, neighborhood and built environment, economic stability, and education access and quality, are major drivers for cardiovascular health outcomes.[51] We can therefore think that SDoH and cardiovascular disease create a vicious circle independent from the impact of traditional risk factors.

In 2019, van der Tol et al compared government reimbursement for dialysis worldwide performing a cross-sectional global survey of nephrologists in 90 countries. Governments from 81 countries (90%) reimbursed dialysis and they found that reimbursement of dialysis is insufficient in low- and middle-income countries having a high effect on public health expenditure.[52] The cost of treatment is an important cause of financial hardship in countries without universal coverage.

It is important to strengthen current kidney health strategies and develop a transdisciplinary model that considers demographic characteristics and incorporates individual and population risk factors and the population health perspective into public health policy.[53]

CKD is common in racial/ethnic minority groups,[54–58] indicating unacceptable health disparities and inequalities in access to health care. Poverty is a risk factor for CKD,[2] so the social, economic, environmental and structural inequalities that explain health inequalities contribute to intergroup differences in health outcomes both within and between societies. Inequalities in kidney disease and poor health outcomes could be caused by financial difficulties in different populations.[59] Despite the inherent complexity of these factors, it is possible to intervene because they are mostly modifiable factors aimed at reducing the risk of CKD and minimizing the incidence of kidney failure.

A 2015 observational study examined the association between modifiable lifestyle and social factors and the incidence and progression of early CKD in people with type 2 diabetes. Lifestyle/social factors, including tobacco and alcohol use, physical activity, stress, financial worries, social network size and education level, were summarized by the Social Network Score (SNS), and education level was a significant independent risk factor for CKD and death.[60] Recently, the results of a web-based structured survey involving English-speaking participants over the age of 18 years who were diagnosed with stage 3–5 CKD, had received dialysis or had undergone a kidney transplant, and lived in a rural area in Australia[61] were published. The authors concluded that rural households face significant financial difficulties due to the costs they incur for CKD treatment and other health-related services.[61]

Bhanvadia et al summarized the literature regarding FT among patients with prostate, bladder, and kidney cancer.[62] The authors found that FT was associated with having a younger age at diagnosis, being black, having a low socio-economic status, having low educational attainment, and living in a rural location. In addition, financial hardship was associated with lower quality of life and poor adherence to treatment and was common in countries with universal health coverage as well as in countries without universal health coverage, although the nature of these costs differed. The authors concluded that FT was common in patients with prostate and bladder cancer and remains uncharacterized in those with kidney cancer.[62] Data from the National Cancer Institute's Survival, Epidemiology, and End Results registry were analyzed to determine whether socioeconomic status predicts tumor size and local extent at presentation and whether this association led to differences in survival among patients diagnosed with renal cancer between 2004 and 2010.[63] The authors studied more than 40,000 patients and found that low socioeconomic status was associated with poorer survival, which may be related to a tendency for larger and more locally advanced tumors at diagnosis.[63] The investigations analyzed in this review could not suggest any conclusions about the effect of FT and CKD on long-term outcomes because of the study designs.

As shown in our study, FT measurement is challenging because there is no uniform consensus. Witte et al reported inconsistency in the recording and use of the main domains representing perceptions of and responses to FT.[64] The COST score has been shown to be reliable and valid for measuring FT.[19] In our analysis, the proposed score was used in patients with nephrolithiasis and renal tumors but not in patients diagnosed with CKD. Our results suggest that it is necessary to develop strategies to reduce FT, including systemic changes to minimize cost-sharing, optimize shared decision-making, implement measures to reduce drug costs, expand insurance coverage and use financial navigation services.[64]

The COST was developed and validated using 11 items, and it reveals the increasing influence of socioeconomic conditions on cancer patients' outcomes. This score focuses on general financial well-being related to healthcare costs, such as the ability to afford medications, out-of-pocket expenses, and the impact on quality of life.[18,19] However, this score is not validated worldwide, and a different diagnostic mean has been proposed for oncology patients. The Patient-Reported Outcome for Fighting Financial Toxicity (PROFFIT) consists of 16 items and has been developed in a country with a fully public health-care system. The score is based on 7 questions related to the outcomes and 9 related to FT. Each question addresses the topics of monthly expenses, financial resources, concerns about the economic future, financial impact on medical care, leisure activities or obtaining essential goods, and ability to work.[65,66] The determinants examined are the need for and costs related to transportation to receive treatment, additional medical expenses and support from health-care professionals. For the above mentioned reasons, our research group is planning to evaluate FT in Italian CKD patients using the PROFFIT questionnaire.[67]

These data underline that definition of FT is still a matter of debate, there is still uncertainty about the validity of the inferences drawn as they pertain to the members of the source population, the validity of the inferences as they pertain to people outside the source population, reporting and precision of different studies. The methods used for detecting FT could be based on consultations, questionnaires, expenditures and database records analysis. A systematic review assed financial hardship by evaluating income level, employment status, source of health care funding and financial status.[68] Researchers' community is still discussing about the best method that should be used for evaluating FT.

Up to now, FT could be evaluated by the use of the COST questionnaire in the United States, however PROFFIT questionnaire has been suggested in Europe. PROFFIT-score was reported to be significantly higher for patients living in South Italy, those with lower education level, those who were freelancer/unemployed at diagnosis and those who reported significant economic impact from the COVID-19 pandemic.[66] Obviously the validity of these two diagnostic means should be kept on testing in different populations with distinct clinical conditions. Also special populations such as hemodialysis, peritoneal dialysis patients and kidney transplanted recipients have to be evaluated. The relationship between FT and dialysis is closely tied to the high costs of treatment, the long-term nature of care, and the significant lifestyle adjustments required for patients undergoing dialysis. These factors often create financial strain for patients and their families, impacting their quality of life and ability to adhere to treatment. A review published in 2021, evaluated the associations between financial hardship and symptom burden in dialysis patients. Financial hardship was tested by income level, employment status, healthcare funding, and financial status. Authors found that poor financial status may have a negative effect on several symptoms, including depression, fatigue, pain, and sexual dysfunction.[68] Unfortunately, data on FT regarding renal transplantation are scanty, FT can impact a patient's access to transplantation, adherence to post-transplant care, and overall health outcomes.

Limitations

Our study revealed that health care professionals need to improve their knowledge about the relationship between FT and renal disease; however, how to identify patients with FT is still a matter of debate. Our findings indicate that there is a paucity of data regarding the effects of FT on different outcomes, especially because the selected studies were cross-sectional in nature. FT is a nonmedical risk factor that can negatively influence kidney health and quality of life, and because it is a complex item that requires nonmedical skills, new studies involving different professionals that consider environmental, physical and emotional risk factors are needed.[54,55]

Conclusion

Health professionals should recognize FT in patients with CKD, considering socioeconomic profiles, to formulate patient-centered care plans. It is important to understand the diversity of different populations, to use the skills of cultural competence and sensitivity and to communicate effectively in the context of patient homes and communities. In this way, the likelihood of patients adhering to medical recommendations and prescribed therapies can be increased.

SDoH are frequent findings in CKD,[3] factors contributing to financial toxicity, such as medical expenses, insurance coverage, lost income, caregiver costs, travel and lodging, emotional and psychological costs, and impact on quality of life should become items for planning future research,[67] especially considering the low level of consciousness of the general population about them.[69]

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors report no conflicts of interest in this work.

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