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Article

Financial Burden and Psychological Impact on Patients and Family with Chronic Kidney Disease on Haemodialysis: A Cross-sectional Study in Rural Bangladesh

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Abstract

Introduction: *Chronic kidney disease (CKD) impacts around 10% of people globally while in Bangladesh the rate is 22.48% which marks a significantly higher rate than the global scale. Hemodialysis is one of the most impactful treatments for end-stage renal disease, is somewhat costly for a nation like Bangladesh where 73% of healthcare costs are borne out-of-pocket. Patients who undergo hemodialysis face economic challenges and psychological stress. This study explored the financial strain and mental health consequences faced by CKD patients while receiving hemodialysis treatment in Bangladesh.*

Methods: *This cross-sectional study was carried out at Kumudini Hospital in Tangail during September and October 2024, for the purposeful sampling to collect data of 40 CKD patients who received regular hemodialysis. We used a standard questionnaire for collecting data, utilizing demographic characteristics, economic costs, and mental health status via the Generalized Anxiety Disorder 7 (GAD-7) scale, evaluated both before and after dialysis sessions. The statistical analysis involved descriptive information, Chi-square tests, and Spearman's correlation to identify relationships between economic costs and mental health scores.*

Result: *CKD primarily affects middle-aged individuals (75% of patients aged 40-69 years old) and predominantly women (57.5%). The frequency of unemployment following dialysis saw a significant increase, rising from 5% to 32.5%, while average income fallen by 77.2% (from 9,007 to 2,050 BDT). Monthly dialysis costs were more or less 19,425 BDT, with relatives (35%) and family members (27.5%) serving as the main sources of financial aid. A decline in mental health status was observed post-dialysis, with moderate anxiety increasing from 10% to 35%. Notable positive correlations were found amid post-dialysis anxiety and factors such as reduced income ($p=0.02$), dependency on relatives ($p=0.04$), and employment status ($p=0.03$).*

Conclusion: *Hemodialysis therapy imposes a substantial financial burden and psychological stress on patients with CKD in Bangladesh, revealing a strong relationship between economic challenges and declining mental health. These results underscore the necessity for robust support systems that encompass both financial aid and psychological care for this at-risk group.*

Introduction

Chronic kidney disease (CKD) represents a progressive condition defined by the slow deterioration of kidney functionality over time, ultimately leading to end-stage renal disease (ESRD). On a global scale, CKD affects nearly 10% of individuals, establishing it as a leading factor in mortality and disability [1,2]. In Bangladesh, the prevalence rate is notably elevated compared to the worldwide average, as highlighted by a meta-analysis reporting a rate of 22.48% [3,4]. Dialysis or hemodialysis serves as a vital treatment option for individuals grappling with kidney failure, particularly ESRD, facilitating the removal of excess fluid and waste from the bloodstream when the kidneys are unable to perform this function [5]. Dialysis has transformed into a more costly substitute for kidney transplantation and continues to be the predominant treatment method for ESRD [6]. A thorough investigation into the global management of CKD in stage G3a reveals that the average annual costs per patient escalate markedly from earlier stages compared to dialysis (stage G3a, mean: $3060 versus hemodialysis, mean: $57,334; peritoneal dialysis, mean: $49,490); estimates for annual transplant costs are also significantly elevated (initial: $75,326; subsequent: $16,672) [7]. Furthermore, CKD entails indirect costs such as lost productivity, caregiver expenses, and non-medical costs like transportation to healthcare facilities [8]. In Bangladesh, around 73% of healthcare spending is out-of-pocket, posing challenges for numerous CKD patients in accessing treatment [9]. The expense of hemodialysis in Bangladesh ranges from 400-4500 BDT (USD 4-45) per session, leading to a monthly expenditure of at least 20,000 BDT or approximately 200 USD [10]. Approximately 40% of patients discontinue dialysis

after 3-4 months due to financial constraints [11]. In addition to the economic crisis that many individuals are experiencing, it is also vital to emphasize that psychological distress, which includes a broad spectrum of emotional and mental health challenges, is recognized as a highly common condition among all patients suffering from chronic kidney disease (CKD) during the hemodialysis period. A few studies suggest that about 70% of CKD patients experience psychological distress, with anxiety and depression being the most common issues [12]. Anxiety affects an estimated 46-58% of patients, whereas depression is observed in 32-50% of cases, exhibiting varying levels of severity [13]. CKD patients receiving dialysis experience significant changes to their lifestyle, including regular hospital visits, dietary restrictions, and the physical demands of treatment, all of which can exacerbate anxiety, depression, and stress levels [14,15]. Moreover, the chronic nature of the illness and uncertainty regarding the future further intensify mental health issues, showing a strong link to depression, especially in resource-limited environments. The purpose of this study is to examine the economic challenges and mental health obstacles faced by CKD patients in Bangladesh while undergoing hemodialysis treatment.

Methods

This study was conducted at the dialysis unit of Kumudini Hospital, Mirzapur, Tangail, from September 10, 2024, to October 10, 2024. The study utilized a cross-sectional design with purposive sampling. A total of 40 CKD patients participated in the mental health assessment, while 40 patients were included in the financial burden analysis.

Inclusion criteria included adult patients (≥18 years) undergoing regular hemodialysis who provided informed consent. Data collection was performed using a structured questionnaire, comprising sections on demographic characteristics, comorbidities, dialysis-related factors, financial burden, and mental health status. Financial burden was assessed using a semi-structured interview schedule adapted from Pai and Kapur's method, evaluating its impact on family expenses, daily life disruptions, and stress levels.

To measure the mental impact of dialysis, the Generalized Anxiety Disorder 7 (GAD-7) scale was administered pre- and post-dialysis, categorizing mental health impact into four levels: minimal (0-4), mild (5-9), moderate (10-14), and severe (15-21). Additionally, data on dialysis duration (in months), frequency (per week), and CKD duration (in years) were recorded.

Descriptive statistics were used to summarize the participants' demographic, clinical, and financial characteristics. The Chi-square test was applied to evaluate the association between financial burden and quality of life, while Spearman's correlation was used to determine relationships between economic burden and overall life satisfaction, as well as dialysis-related factors and mental health scores. A p-value of <0.05 was considered statistically significant. Statistical analyses were conducted using SPSS version 26.0.

Results

The demographic data regarding patients diagnosed with CKD reveals that the age groups of 40-49, 50-59, and 60-69 exhibited the highest prevalence, with 11 (27.5%), 10 (25%), and 9 (22.5%) respondents, that collectively accounting for a significant 75% of the total cohort analyzed. The distribution of respondents among the age categories of 20-29, 30-39, and 70-80 is considerably lower, with the number of respondents being 2 (5%), 4 (10%), and 4 (10%) correspondingly.

Table 1: Demographic Distribution of CKD Patients on Hemodialysis (n=40)

Demographic Characteristics	(n) (%)
Age Group	
20-29	2 (5%)
30-39	4 (10%)
40-49	11 (27.5%)
50-59	10 (25%)
60-69	9 (22.5%)
70-80	4 (10%)
Sex	
Male	17 (42.5%)
Female	23 (57.5%)
Marital Status	
Unmarried	3 (7.5%)
Married	36 (90%)
Widow	1 (2.5%)
Education	
Primary	14 (35%)
Secondary	18 (45%)
Above HSC	5 (12.5%)
Illiterate	3 (7.5%)
Religion	
Islam	38 (95%)
Hinduism	2 (5%)

The assessment of age-related information highlights that CKD predominantly affects individuals within the lower middle-age groups and older groups while exhibiting a lessened influence on younger demographic cohorts. The gender-based analysis of CKD patients reveals a higher incidence among female individuals, with 23 respondents (57.5%) compared to 17 male respondents (42.5%). The marital status data indicates that the majority of CKD-affected individuals are married, with a total of 36 respondents (90%), in contrast to 3 unmarried individuals (7.5%) and 1 widowed individual (2.5%). The educational background data elucidates that only 5 individuals possess educational qualifications exceeding the Higher Secondary Certificate (HSC) level (12.5%), while 14 individuals have achieved a primary education (35%), 18 individuals have completed HSC (45%),

and 3 individuals are classified as illiterate (7.5%). The educational statistics further indicate that a significant 87.5% of individuals afflicted with CKD have attained either primary education, or HSC, or lack formal education, which may adversely impact their employment prospects and financial capacity to manage medical expenses. Given that the study was conducted in Bangladesh, the religious demographic reveals that Muslim individuals constitute the predominant religious group, with 38 respondents (95%), followed by 2 respondents identifying as Hindu. Thus, the comprehensive demographic distribution data presented in Table 1 concludes that the demographics most affected by CKD within the Bangladeshi population are lower-middle-aged individuals, females, and married persons, predominantly with educational backgrounds ranging from primary to higher secondary levels.

Table 2: Financial Impact of Hemodialysis on CKD Patients (n=40)

Income & Employment	**(n) (%)**
Prior Occupation	
Housewife	22 (55%)
Business	6 (15%)
Labor/Private Job	5 (12.5%)
Unemployed	2 (5%)
Other	5 (12.5%)
Post-Dialysis Occupation	
Housewife	22 (55%)
Unemployed	13 (32.5%)
Retired	3 (7.5%)
Inactive	2 (5%)
Prior Income (BDT)	
Mean ± SD	9007.5 ± 13025.3
Range	0 - 50,000
Post Income (BDT)	
Mean ± SD	2050 ± 4872.5
Range	0 - 20,000
Income Reduction (%)	77.2%

The occupation survey conducted among CKD patients aimed to evaluate the financial effects of hemodialysis. From the demographic data in Table 1, it was observed that out of the 40 patients included in this survey, 23 were females. The occupational data reveal that there are 22 individuals classified as housewives (55%), underscoring their dependence on family members for financial sustenance. The number of individuals engaged in business is 6 (15%), while those in labor or private jobs number 5 (12.5%), and other occupations also account for 5 (12.5%), with 2 respondents (5%) being unemployed. In assessing the post-dialysis data, we recognized that the total of housewives remained constant at 22 (55%), yet the unemployment rate saw a significant escalation to 13 respondents (32.5%). Additionally, there were 3 respondents identified as retired (7.5%) and 2 respondents categorized as inactive (5%). This analysis indicates a considerable transition of individuals from employment to unemployment, raising significant concerns about their financial insecurity. The income statistics demonstrate an average income close to 9000 BDT, with a spectrum from 0 to 50,000 BDT, while the post-dialysis income reflects a fall to an average of nearly 2000 BDT, ranging from 0 to 20,000 BDT, indicating a notable income reduction of 77.2%. The information that has been thoroughly compiled and presented in Table 2 demonstrates that there has been a significant uptick in the unemployment rate that has occurred after individuals undergoing dialysis treatment, a phenomenon that is intricately linked to the noticeable decline in income experienced by these individuals, which can largely be attributed to the overwhelming burden imposed by medical costs and various other indirect expenses that they are forced to manage.

Table 3: Sources and Monthly Expenditure for Dialysis Treatment (n=40)

Sources of Financial Support	**(n) (%)**
Family Members	11 (27.5%)
Relatives	14 (35%)
Savings	7 (17.5%)
Property Sales	3 (7.5%)
House Rent	2 (5%)
Others (Donor, Business, etc.)	3 (7.5%)
Monthly Dialysis Expenditure (BDT)	
Minimum	5,800
Maximum	33,600
Mean ± SD	19,425 ± 5,298
Per-Session Cost (BDT)	
Minimum	1,800
Maximum	5,000
Mean ± SD	2,588 ± 655

Table 3 details the sources and monthly expenses associated with dialysis treatment, focusing on financial support sources, monthly dialysis costs, and the cost per session. The data on financial support sources indicates that individuals primarily obtain their financial assistance for hemodialysis from family members and relatives, with 11 (27.5%) and 14 (35%) respondents respectively. The number of respondents who depend solely on their savings stands at 7 (17.5%), while 3 (7.5%) rely on property sales, 2 (5%) on house rents, and 3 (7.5%) on other sources (such as donors or businesses). The data distinctly shows that individuals with CKD primarily depend on their family members and relatives for financial support concerning their hemodialysis requirements. The monthly expenditure for dialysis varies from a low of 5,800 BDT to a high of 33,600 BDT, with an average cost of approximately 19,425 BDT. The data regarding per-session costs indicates that a minimum of 1,800 BDT is necessary for each session, reaching a maximum of 5,000 BDT, with an average cost of 2,588 BDT. The financial information pertaining to the income levels of patients, as presented in Table 2, in conjunction with the costs associated with each dialysis session and the cumulative monthly expenses for dialysis treatment outlined in Table 3, strongly indicates that a significant majority of patients possess only minimal and often

unreliable sources of income that are insufficient to cover the substantial costs associated with their necessary medical treatment; furthermore, it is evident that the overall cost of treatment is notably elevated by a considerable margin, making it exceedingly challenging for most individuals to manage and afford these expenses without experiencing significant financial strain.

The data presented in Table 4 elucidates the impact on mental health (pre and post-dialysis) based on GAD-7 scores, with mental health delineated into minimal, mild, moderate, and severe effects for both pre-dialysis and post-dialysis intervals. In the pre-dialysis phase, there were 20 respondents (50%) classified as experiencing minimal impact, a figure that decreased to 8 respondents (20%) in the post-dialysis phase. Regarding mild impact, the number of respondents before dialysis was 16 (40%), which increased to 18 respondents (45%) after dialysis. The data pertaining to moderate impact indicates that 4 (10%) patients were affected pre-dialysis, while the post-dialysis period saw an increase to 14 respondents (35%). Notably, there were no cases of severe mental health impact, with no respondents recorded in either the pre-dialysis or post-dialysis assessments. Overall, the analysis from Table 4 reveals a decline in the number of patients experiencing minimal impact, while mild and moderate impacts increased from the pre-dialysis to the post-dialysis mental health evaluations, with no severe impact registered in either assessment phase. The thorough analysis of the data displayed in Table 4 reveals that, although the minimal impact felt by patients has significantly diminished, there has been a marked rise in both mild and moderate impacts when comparing the mental health evaluations carried out before the start of dialysis to those conducted after the dialysis process was completed, with the findings showing no noteworthy changes or effects in the severe impact categories for both pre-dialysis and post-dialysis evaluations.

Table 4: Mental Health Impact (Pre & Post Dialysis) Based on GAD-7 scores (n=40)

Mental Health Assessment	Pre-Dialysis (n) (%)	Post-Dialysis (n) (%)
Minimal Impact (0-4)	20 (50%)	8 (20%)
Mild Impact (5-9)	16 (40%)	18 (45%)
Moderate Impact (10-14)	4 (10%)	14 (35%)
Severe Impact (15-21)	0 (0%)	0 (0%)

Table 5 denotes the predictive relationship between mental health and clinical variables concerning pre-dialysis and post-dialysis mental scores derived from statistical analysis, where a p-value of less than 0.05 is deemed statistically significant. The pre-dialysis mental health score reveals that the duration of dialysis has a p-value of 0.08, indicating it is not statistically significant, yet it may show some correlation with the decline or deterioration of mental health conditions. Conversely, the frequency of dialysis and the duration of CKD demonstrate a negative correlation with mental health, yielding p-values of 0.36 and 0.16, respectively. In the post-dialysis analysis, the duration of dialysis shows a p-value of 0.03, signifying a positive correlation between the length of dialysis and the deterioration of mental health, while the frequency of dialysis presents a negative correlation with mental health, evidenced by a p-value of 0.25, and the duration of CKD has a p-value of 0.09, which, although not statistically significant, suggests that a prolonged history of CKD may lead to increased mental health challenges. The in-depth assessment provided in Table 5 highlights that the time spent on dialysis in the post-dialysis phase has a significant positive association with anxiety levels, potentially due to the financial stress related to managing healthcare expenses along with other indirect costs that come forth during this challenging time.

Table 5: Correlation Between Mental Health and Clinical Variables (Spearman's Coefficient, r) (n=40)

Clinical Variable	Pre-Dialysis Mental Score (r, p-value)	Post-Dialysis Mental Score (r, p-value)
Duration of Dialysis	0.25 (p=0.08)	0.38 (p=0.03*)
Frequency of Dialysis	0.12 (p=0.36)	0.16 (p=0.25)
Duration of CKD	0.20 (p=0.16)	0.27 (p=0.09)

**Statistically significant at p<0.05*

The data presented in Table 6 elucidates the correlation between economic burdens and mental factors through an analysis of five distinct categories of economic factors that CKD patients typically utilize for managing dialysis-related expenses. The findings derived from income reduction data reveal a positive correlation between increased income loss and elevated anxiety levels, as evidenced by a p-value of 0.02; additionally, the frequency data indicates that 77.2% of patients encountered a decrease in income, which may contribute to heightened levels of psychological distress. The data concerning dependencies on relatives, with a p-value of 0.04, suggests a moderate positive correlation between financial dependence on relatives and increased anxiety levels while the frequency data shows 50% of patients reported some degree of reliance on their relatives for financial assistance. The analysis of monthly dialysis expenses, with a p-value of 0.06, indicates a weak statistical correlation between the average monthly expenditure of patients and their anxiety levels. The frequency data reveals that 100% of patients are capable of managing their monthly expenses; however, there exists a potential stressor attributable to the moderate p-value observed in this analysis. The data regarding funding sources, specifically personal savings, indicates a p-value of 0.08, which suggests a negative correlation between individuals who depend on personal savings for treatment costs and their anxiety levels. The frequency data illustrates that 32.5% of patients utilize their personal savings to cover dialysis expenses, resulting in a marginally reduced likelihood of

increased anxiety levels, as evidenced by the absence of a significant p-value. The p-value of 0.03 related to employment status post-dialysis indicates a positive correlation with anxiety levels among those employed post-dialysis, with 32.5% of patients acknowledging this circumstance while managing their dialysis costs. This underscores the psychological implications associated with job loss due to the financial burdens of dialysis, which correlate with increasing levels of mental trauma. Collectively, the data from Table 6 suggests that income reduction, dependencies on relatives, and employment status following hemodialysis demonstrate a clear statistically significant positive correlation with the escalation of mental health issues, while the monthly cost of dialysis and the source of funding (personal savings) may also represent contributing factors to the increasing psychological distress experienced by CKD patients due to the financial obligations associated with dialysis.

Table 6: Correlation Between Economic burden and Mental Health Factors (n=40)

Economic Factors	Correlation with Post-Dialysis Anxiety(r-value)	p-value	(%)
Income Reduction (%)	+0.42	0.02*	77.2%
Dependence on Relatives (%)	+0.35	0.04*	50.0%
Monthly Dialysis Cost (BDT)	+0.31	0.06	100%
Source of Funding (Personal Savings)	-0.28	0.08	32.5%
Employment Status Post-Dialysis	+0.40	0.03*	32.5%

Discussion

The analysis of our study provides a strong indication of the economic burden and psychological stress of hemodialysis therapy among CKD patients in Bangladesh. The population characteristics of our study group are relatively consistent with global patterns, wherein CKD patients dominate the middle-aged and older populations, 75% of whom fell within the 40-69 years age. However, our study's higher female prevalence (57.5%) disputes some international studies of male predominance and requires a bigger sampling analysis into gender-related risk factors in the context of Bangladesh. The educational data reveals vulnerability in the educational background of patients, with 87.5% of the respondents reporting HSC or lower education level. This education deficit likely translates into fewer jobs and income capacity, contributing to the economic strain of having an expensive chronic condition. The dramatic post-dialysis shift in work status, with unemployment increasing from 5% to 32.5%, is a significant economic toll of CKD care. This outcome is particularly worrying when noted with regard to the average drop of 77.2% in earnings from roughly 9000 BDT down to 2000 BDT on the commencement of dialysis. The economic burden is also clear when income levels are contrasted with the cost of treatment with an average dialysis cost per month being 19,425 BDT and per-session cost averaging 2,588 BDT which led most patients to face an enormous economic deficit. This elucidates the excessive reliance on family members (27.5%) and relatives (35%) to cover the expenses of CKD treatment, indicating that the expense of CKD treatment in Bangladesh is typically higher than the financial capacity of individuals, leading to a ripple effect of economic burden [16]. The psychological impact data demonstrates a clear deterioration in mental state status following the time of dialysis compared to before dialysis status. The shift from mild anxiety levels from pre-dialysis (40%) to post-dialysis (45%) and a threatening level shift of moderate impact of anxiety from pre-dialysis (10%) to post-dialysis (35%) reflects the psychological toll of therapy. Interestingly, no single case of severe anxiety was reported during either the pre-dialysis or post-dialysis evaluation phases, possibly suggesting some degree of psychological adjustment or resilience in the patients, or perhaps reflecting limitations of the evaluation instrument's sensitivity in this specific patient group. The correlational analysis provided informative data regarding the forecasters of psychological distress. The statistical correlation between length of dialysis and anxiety ($p=0.03$) reflects that the cumulative impact of longer treatment further impacts mental well-being. Similarly, income reduction ($p=0.02$), dependence on relatives ($p=0.04$), and employment status after dialysis ($p=0.03$) also exhibited significant positive correlations with scores of anxieties, validating the entangled relationship between economic hardship and psychological distress. These results indicate a vicious categorization of disadvantages of CKD and its treatment that causes unemployment and loss of income, leading to financial dependence, which in turn fuels psychological distress. This distress could then have additional effects on treatment adherence, quality of life, and even disease progression, although these were outside the scope of our present study. The elevated cost of treatment in comparison to the income

level reported in our study is consistent with earlier studies suggesting that CKD management places a high economic burden on low and middle-income nations. The monthly cost of dialysis is reported as about 19,425 BDT ($152 USD), which can be understood as to why 40% of patients supposedly stop dialysis after 3-4 months [17].

Our findings indicate the need for strong support mechanisms that address the economic and psychological aspects of CKD care. Promising interventions include increased subsidies on healthcare for dialysis therapy, vocational rehabilitation schemes for CKD patients, psychological support counseling in routine nephrology practice, and economic advice for patients and their families.

Limitations of The Study

The study involved a limited study group (n=40) selected through purposive sampling from a single hospital, making it difficult to generalize the findings to the wider CKD population in Bangladesh. The cross-sectional approach delays the ability to establish a causal relationship between economic strain and long-term mental health effects. Previous mental health conditions or other relevant confounding factors that might influence anxiety levels were not controlled for in the study.

Conclusion

Hemodialysis, which is crucial for patients suffering from chronic kidney disease (CKD), imposes a significant financial burden that not only affects their economic stability but also contributes to considerable psychological distress, establishing a notable relationship between the economic challenges faced by these individuals and the subsequent decline in their mental health. The comprehensive findings derived from this study underscore the urgent necessity for the development of comprehensive support systems that not only provide financial aid to alleviate the economic pressures but also incorporate psychological interventions aimed at improving the overall well-being of this particularly vulnerable segment of the population.

Recommendation

Developing comprehensive support systems that integrate financial assistance programs with psychological counseling services in the midst of instituting subsidized healthcare cost policies for CKD patients undergoing hemodialysis.

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