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**Health Inequity Associated with Financial Hardship Among Patients with End-stage Kidney Disease: A Secondary Analysis**

--Manuscript Draft--

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| **Corresponding Author:** | Marques Shek Nam Ng, RN, PhD The Chinese University of Hong Kong Shatin, New Territories HONG KONG |
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| **Abstract:** | Financial hardship is a common challenge among patients with end-stage kidney disease and may have negative health consequences. Therefore, financial status is regarded as an important determinant of health, and its impact needs to be investigated. This cross-sectional study aimed to identify the differences in patient- reported and clinical outcomes among patients with different financial status. 354 patients with end-stage kidney disease were recruited from March to June 2017 at two regional hospitals in Hong Kong. The Dialysis Symptoms Index and Kidney Disease Quality of Life-36 were used to evaluate patient-reported outcomes. Clinical outcomes were retrieved from medical records and assessed using the Karnofsky Performance Scale (functional status) and Charlson Comorbidity Index (comorbidity level). Patients were stratified using two dichotomised variables, employment status and income level, and their outcomes were compared using independent sample t-tests. In this sample, the employment rate was 17.8% and the poverty rate was 61.2%. Compared with other patients, increased symptom distress, a higher comorbidity level, and more emergency room visits were found in patients with poorer financial status. Unemployed patients reported a decreased physical quality of life, while low-income patients had a lower serum albumin concentration than other patients (all p < 0.05). Financially underprivileged patients experienced health inequity in terms of impaired patient- reported and clinical outcomes. Attention needs to be paid to these patients by providing financial assessments and interventions. Additional research is warranted to understand the experience of financial hardship and examine equity in healthcare. |
| **Order of Authors:** | Marques Shek Nam Ng, RN, PhD |
| Dorothy Ngo Sheung Chan |
| Winnie Kwok Wei So |
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### Health Inequity Associated with Financial Hardship Among Patients with

1. End-stage Kidney Disease: A Secondary Analysis

### (Short Title: Health Inequity and Financial Hardship in ESKD)

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9 Marques Shek Nam NG1\*, Dorothy Ngo Sheung CHAN1, Winnie Kwok Wei SO1

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1. 1The Nethersole School of Nursing, Faculty of Medicine, The Chinese University of Hong
2. Kong, Hong Kong, China

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1. \*Corresponding author
2. Email: [marquesng@cuhk.edu.hk](mailto:marquesng@cuhk.edu.hk)

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# Abstract

1. Financial hardship is a common challenge among patients with end-stage kidney disease and

21 may have negative health consequences. Therefore, financial status is regarded as an

1. important determinant of health, and its impact needs to be investigated. This cross-sectional
2. study aimed to identify the differences in patient-reported and clinical outcomes among
3. patients with different financial status. 354 patients with end-stage kidney disease were
4. recruited from March to June 2017 at two regional hospitals in Hong Kong. The Dialysis
5. Symptoms Index and Kidney Disease Quality of Life-36 were used to evaluate patient-
6. reported outcomes. Clinical outcomes were retrieved from medical records and assessed
7. using the Karnofsky Performance Scale (functional status) and Charlson Comorbidity Index
8. (comorbidity level). Patients were stratified using two dichotomised variables, employment
9. status and income level, and their outcomes were compared using independent sample t-tests.
10. In this sample, the employment rate was 17.8% and the poverty rate was 61.2%. Compared
11. with other patients, increased symptom distress, a higher comorbidity level, and more
12. emergency room visits were found in patients with poorer financial status. Unemployed
13. patients reported a decreased physical quality of life, while low-income patients had a lower
14. serum albumin concentration than other patients (all p < 0.05). Financially underprivileged
15. patients experienced health inequity in terms of impaired patient-reported and clinical
16. outcomes. Attention needs to be paid to these patients by providing financial assessments and
17. interventions. Additional research is warranted to understand the experience of financial
18. hardship and examine equity in healthcare.

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# Introduction

1. The global burden of end-stage kidney disease (ESKD) is increasing. More than 2
2. million patients have been diagnosed and treated with life-sustaining dialysis therapy
3. worldwide (1). In some countries, 2–3% of healthcare expenditures are used for managing
4. ESKD, and the demand for dialysis continues to surge (2). At the individual level, patients
5. often experience financial hardship associated with high treatment costs, unemployment, and
6. reduced income. Although many countries provide reimbursement for dialysis therapy,
7. patients are required to cover 12–71% of the costs out of pocket (3). In addition, these
8. patients have reduced productivity associated with disease-related disabilities. According to
9. an international survey (4), less than 55% of haemodialysis (HD) and 68% of peritoneal
10. dialysis (PD) patients are employed. Limited income due to decreased employment may
11. amplify financial hardship among these patients (5).
12. Financial hardship is a profound and significant determinant of health. Patients utilize
13. their personal resources to pay for their medical and other daily expenses, which may lead to
14. the depletion of financial reserves or incurrence of debt (6). Evidence suggests that impaired
15. financial well-being is associated with poor physical and psychological health in patients with
16. chronic illnesses (7). Negative health outcomes, including depression, anxiety, lower health-
17. related quality of life (HRQoL), and higher mortality risk, have been reported (8,9). These
18. outcomes may be seen as the consequences of health inequity caused by social determinants,
19. especially financial factors.
20. Despite the impact of financial hardship on health, few studies have evaluated the
21. relationships between this hardship and various health outcomes among patients with ESKD
22. (10). A better understanding of these relationships may advance our understanding of health
23. inequity among patients with ESKD. Hence, in addition to financial aids, renal care providers
24. can proactively identify financially underprivileged patients and provide specific
25. interventions that promote equal participation in daily life (11). Therefore, the aim of this
26. secondary analysis was to identify the differences in patient-reported and clinical outcomes
27. between ESKD patients with high and low financial status.

# Materials and Methods

1. The cross-sectional data of 354 patients from a mixed-methods study were analysed
2. (12). These patients were recruited from two regional hospitals in Hong Kong from March to
3. June 2017. The inclusion and exclusion criteria have been described in our previous reported.
4. After obtaining informed consent, a research assistant administered a questionnaire and
5. reviewed electronic health records. This study was approved by the institutional research
6. boards of the university and the involved hospitals.

## Instruments

1. Symptoms and HRQoL were selected as the patient-reported outcomes. The Dialysis
2. Symptoms Index (DSI) was used to assess 30 symptoms experienced in the past month. A
3. higher score indicates a higher level of distress. The Chinese version of the DSI demonstrated
4. excellent content validity (0.99) and internal consistency (α = 0.87) (13). The Kidney Disease
5. Quality of Life-36 was used to evaluate the HRQoL of patients. It consists of 24 disease-
6. specific and 12 generic questions that can be divided into three subscales and two summary
7. scores. A higher score indicates better performance in the specific domain. Its Chinese
8. version demonstrated good test-retest reliability (interclass correlation coefficient = 0.79–
9. 0.92) and acceptable internal consistency (α = 0.60–0.93) (14).
10. The clinical outcomes included the functional status, comorbidity level, healthcare
11. service utilization, and biochemical parameters. The Karnofsky Performance Scale was used
12. to evaluate functional status (range: 0–100) (15). The Charlson Comorbidity Index was used
13. to assess the comorbidity level (range: 0–33) (16). Other clinical data were retrieved from the
14. patients’ electronic health records.

## Analyses

1. Background characteristics and outcomes were summarised using descriptive
2. statistics (e.g., frequency, percentage, mean). Two dichotomized variables that reflected the
3. patient’s financial status were created: employment status and income level. In terms of
4. income level, those earning a monthly household income of ≤ 10,000 HKD (approximately
5. 1,290 USD) were regarded as below the poverty line, which is in line with the government’s
6. definition (17). After stratifying the patients by these variables, patient-reported and clinical
7. outcomes were compared using independent sample t-tests. All analyses were conducted
8. using SPSS version 25.0 (IBM Corp., Armonk, NY). A two-sided p-value of < 0.05 was
9. considered as statistically significant.

# Results

1. Of the 354 patients, 58.5% were male. The patients had a mean age of 60.9 years
2. (Table 1). Most of the patients received PD (69.9%) and had been on dialysis for a mean of
3. 51.6 months. Overall, 17.8% of the patients were employed, and 61.2% were below the
4. poverty line. The education level significantly differentiated patients regardless employment
5. status and income level (p ≤ 0.001). Compared with other patients, a larger proportion of
6. employed patients had received kidney transplants (9.5%; p = 0.035), and a larger proportion
7. of patients above the poverty line were married (76.6%; p = 0.01).
8. Table 1 presents the differences in patient-reported and clinical outcomes between
9. groups. Compared with employed patients, those who were unemployed reported higher
10. levels of tiredness (mean: 2.33), joint or bone pain (mean: 1.60), and trouble falling asleep
11. (mean: 2.13) (all p ≤ 0.033). The KDQOL-36 Physical Component Summary scale scores
12. (mean: 37.27) for unemployed patients were significantly lower than for employed patients (p

114 = 0.011). Patients below the poverty line reported higher levels of dry mouth (mean: 1.63),

1. dry skin (mean: 2.68), itching (mean: 2.76), and trouble staying asleep (mean: 2.07) than
2. those above the poverty line (all p ≤ 0.045). Interestingly, patients with lower income had less
3. severe sexual symptoms (p ≤ 0.004), namely a decreased interest in sex (mean: 0.41) and
4. difficulty becoming sexually aroused (mean: 0.37). However, no significant difference was
5. found in other KDQOL-36 sub-scale scores.
6. In terms of clinical outcomes, in general, patients with a poorer financial status had
7. higher comorbidity levels (all p ≤ 0.033) and more emergency room (ER) visits in the past six
8. months (all p ≤ 0.008) than other patients. In addition, patients below the poverty line had a
9. lower serum albumin concentration (mean: 35.39 g/L) than did patients with higher earnings

124 (p = 0.004).

# Discussion

1. The findings from this secondary analysis suggest that patient-reported and clinical
2. outcomes differ between patients with different financial statuses in terms of their
3. employment and income level. Patients who were financially underprivileged reported higher
4. distress associated with symptoms, higher comorbidity levels, and more ER visits than other
5. patients. Consistent with existing evidence (8,9), the impact of financial hardship on health
6. disparities among patients with ESKD warrants additional attention.
7. The rates of unemployment and poverty in this study were much higher than the rate
8. of poor households in the territory (cf. employment rate: 34.9%; poverty rate: 21.4%) (17).
9. This finding is an alarming sign that in this city, which is well known for economic
10. inequality, financial hardship is very common among patients with ESKD. Our findings
11. indicate the negative impact of such hardship within this group. There are some possible
12. reasons for this relationship. As reported in one study (18), financially underprivileged
13. patients may have fewer resources to pay for healthcare services, especially preventive care.
14. This may explain why patients with impaired financial well-being reported poorer outcomes,
15. particularly a higher mean number of ER visits. Therefore, renal care providers need to pay
16. special attention to the financial needs of patients by incorporating appropriate assessments
17. and interventions in routine care (10). Nevertheless, there is a need to examine equity in the
18. healthcare system to ensure that essential services are provided regardless of a person’s
19. financial status. In addition, there may be a reciprocal relationship between financial hardship
20. and outcomes. While symptoms and other outcomes are signs of deteriorating health, patients
21. with a poorer symptom status or poorer outcomes may have a higher demand for healthcare
22. services and a lower physical capacity for engaging actively in employment (19). These
23. consequences lead to increased medical expenditures and decreased income, which
24. eventually intensify financial hardship (6). A better understanding of the experience of
25. financial hardship is warranted to explore the factors that modulate the relationship between
26. financial hardship and health.
27. Our preliminary evidence reveals the consequences of health inequity and suggests
28. directions for researching issues associated with financial hardship among patients with
29. ESKD. However, several limitations warrant consideration. Although cross-sectional data
30. were analyzed and limited variables were evaluated, other factors that might confound the
31. relationship between financial hardship and outcomes (e.g., financial aids) were not
32. controlled. In addition, financial status was conceptualized in terms of employment status and
33. income level only, which might inadequately reflect the full picture of financial well-being.
34. Therefore, the following suggestions are made: 1) factors influencing financial hardship
35. should be identified and controlled in further analyses; 2) a longitudinal study should be
36. conducted to evaluate changes in financial status; and 3) a comprehensive conceptualization
37. of financial hardship should be adopted.

# Conclusion

1. Financial hardship is very common among patients with ESKD, especially in Hong
2. Kong, in terms of high percentages of unemployment and poverty. Our preliminary evidence
3. suggests that this hardship may result in health inequity and manifest in impaired patient-
4. reported and clinical outcomes. Additional research is warranted to understand the experience
5. of financial hardship and the equity of the healthcare system.

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3. collection.

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# Competing Interests Statement

1. The authors have declared that no competing interests exist.

# Ethics Statement

1. This study was approved by the Joint CUHK-NTEC Clinical Research Ethics Committee
2. (reference number: 2017.092). Written consent was obtained from all participants.
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Table 1. Background Characteristics and Comparison of Patient-reported and Clinical Outcomes

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Overall  (N=354) | | | Unemployed  (n=291; 82.2%) | | Employed  (n=63; 17.8%) | | Below Poverty Line  (n=217; 61.3%) | | | | Above Poverty Line  (n=137; 38.7%) | | | |
| *Background characteristics* Male | *N*  207 | *%*  56.7% | *N*  164 | *%*  56.4% | *N*  43 | *%*  68.3% |  | *p*  0.082 | *N*  128 | *%*  59.0% | *N*  79 | *%*  36.4% |  | *p*  0.806 |
| Married | 243 | 66.6% | 206 | 70.8% | 37 | 58.7% |  | 0.061 | 138 | 63.6% | 105 | 76.6% |  | 0.010\* |
| Secondary education | 231 | 63.3% | 177 | 60.8% | 54 | 85.7% |  | <0.001\*\* | 127 | 58.5% | 104 | 75.9% |  | 0.001\* |
| Peritoneal dialysis | 255 | 69.9% | 212 | 72.9% | 43 | 68.3% |  | 0.461 | 158 | 72.8% | 97 | 70.8% |  | 0.682 |
| History of transplantation | 16 | 4.4% | 10 | 3.4% | 6 | 9.5% |  | 0.035\* | 10 | 4.6% | 6 | 4.4% |  | 0.920 |
|  | *Mean* | *SD* | *Mean* | *SD* | *Mean* | *SD* | *t* | *P* | *Mean* | *SD* | *Mean* | *SD* | *t* | *P* |
| Age (years) | 60.93 | 11.89 | 62.70 | 0.11 | 52.63 | 11.00 | 6.51 | <0.001\*\* | 63.36 | 11.51 | 57.10 | 0.12 | 4.98 | <0.001\*\* |
| Month on dialysis | 51.63 | 64.96 | 50.32 | 61.02 | 57.59 | 80.75 | -0.80 | 0.503 | 52.01 | 57.28 | 51.05 | 75.53 | 0.13 | 0.899 |
| *Patient-reported* | *Mean* | *SD* | *Mean* | *SD* | *Mean* | *SD* | *t* | *P* | *Mean* | *SD* | *Mean* | *SD* | *t* | *P* |
| *outcomes*  Tiredness | 2.23 | 1.66 | 2.33 | 1.65 | 1.79 | 1.65 | 2.34 | 0.020\* | 2.21 | 1.64 | 2.28 | 1.70 | -0.386 | 0.700 |
| Dry mouth | 1.49 | 1.56 | 1.54 | 1.58 | 1.24 | 1.43 | 1.38 | 0.164 | 1.63 | 1.60 | 1.26 | 1.46 | 2.22 | 0.027\* |
| Joint/bone pain | 1.51 | 1.75 | 1.60 | 1.75 | 1.08 | 1.69 | 2.14 | 0.033\* | 1.55 | 1.74 | 1.43 | 1.77 | 0.64 | 0.522 |
| Dry skin | 2.42 | 1.73 | 2.42 | 1.78 | 2.40 | 1.51 | 0.10 | 0.918 | 2.68 | 1.68 | 1.99 | 1.73 | 3.72 | <0.001\*\* |
| Itching | 2.58 | 1.74 | 2.66 | 1.76 | 2.21 | 1.62 | 1.86 | 0.063 | 2.76 | 1.75 | 2.28 | 1.70 | 2.58 | 0.010\* |
| Trouble falling asleep | 2.02 | 1.98 | 2.13 | 1.99 | 1.51 | 1.87 | 2.26 | 0.024\* | 2.12 | 1.99 | 1.85 | 1.97 | 1.29 | 0.200 |
| Trouble staying asleep | 1.92 | 1.88 | 2.00 | 1.89 | 1.54 | 1.76 | 1.76 | 0.080 | 2.07 | 1.86 | 1.66 | 1.88 | 2.01 | 0.045\* |
| Decreased interest in sex | 0.56 | 1.28 | 0.54 | 1.29 | 0.70 | 1.20 | -0.92 | 0.361 | 0.41 | 1.08 | 0.82 | 1.51 | -2.99 | 0.003\* |
| Difficulty getting sexually aroused | 0.53 | 1.27 | 0.48 | 1.25 | 0.73 | 1.33 | -1.40 | 0.164 | 0.37 | 1.51 | 0.77 | 1.52 | -2.92 | 0.004\* |
| KDQOL-36 PCS | 37.87 | 9.54 | 37.27 | 9.61 | 40.65 | 8.74 | -2.57 | 0.011\* | 37.51 | 9.56 | 38.45 | 9.50 | -0.90 | 0.367 |
| KDQOL-36 MCS | 48.54 | 10.84 | 48.80 | 11.05 | 47.36 | 9.86 | 0.96 | 0.340 | 47.88 | 10.98 | 49.58 | 10.59 | -1.44 | 0.151 |
| *Clinical Outcomes* | *Mean* | *SD* | *Mean* | *SD* | *Mean* | *SD* | *t* | *P* | *Mean* | *SD* | *Mean* | *SD* | *t* | *P* |
| KPS | 88.59 | 13.43 | 87.56 | 14.07 | 93.33 | 8.61 | -4.24 | <0.001\*\* |  |  |  |  |  |  |
| CCI | 1.83 | 2.00 | 1.98 | 2.05 | 1.14 | 1.64 | 3.05 | 0.002\* | 2.01 | 1.85 | 1.55 | 2.20 | 2.14 | 0.033\* |
| ER attendance | 0.60 | 1.12 | 0.68 | 1.20 | 0.24 | 0.56 | 4.43 | <0.001\* | 0.72 | 1.28 | 0.42 | 0.80 | 2.68 | 0.008\* |
| Serum albumin (g/L) | 35.96 | 4.68 | 35.73 | 4.74 | 36.98 | 4.28 | -1.91 | 0.054 | 35.39 | 4.83 | 36.85 | 4.30 | -2.88 | 0.004\* |

\*P < 0.05; \*\*P < 0.001

Abbreviations: CCI = Charlson Comorbidity Index; ER = Emergency room; g/L = Gram per litre; KDQOL-36 = Kidney Disease Quality of Life-36; ; KPS = Karnofsky Performance Scale; MCS = Mental Component Summary; PCS = Physical Component Summary