論　文　内　容　要　旨

Community-based screening to determine the prevalence, health and nutritional status of patients with CKD in rural and peri-urban Bangladesh

(バングラデシュの農村部および都市周辺部における CKD 患者の有病率、健康状態および栄養状態を判断するためのコミュニティベースのスクリーニング)

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This study is a community-based screening to determine the prevalence, health and nutritional status of patients with CKD in rural and peri-urban Bangladesh.

Introduction: Chronic Kidney Disease (CKD) is becoming more common around the world, and it is being recognized as a future public health threat. Every year, at least 2.4 million people die as a result of CKD, and the overall mortality rate has risen by 41.5% percent between 1990 and 2017. Diabetes, hypertension, and obesity are the most common risk factors for CKD worldwide. In low- and middle-income countries, most patients with kidney failure have limited access to life-saving dialysis and kidney transplantation. Early detection of CKD and reduction of risks factors, therefore, would be the most pragmatic strategy to prevent premature mortality and morbidity in those countries. The prevalence of CKD is increasing among general and disadvantaged population in LMICs and community-based screening services to assess the prevalence and identify the related factors can be a crucial intervention for early case detection. A few studies on CKD have been conducted in Bangladesh, and most of them were hospital based among urban and slum population. Thus, we designed and carried out the population-based screening and early assessment of CKD project to document the prevalence and determine factors associated with CKD in rural and peri-urban Bangladesh.

Methods: This cross-sectional epidemiological research was performed in the Mirzapur sub-district of Tangail, Bangladesh from January to June 2020. The study participants were stratified into 3 age groups (18 to 30 years, 31 to 45 years, and 46 years and older) and selected randomly with the assistance of the Mirzapur Demographic Surveillance System (DSS) database. We screened participants by measuring serum creatinine and urine albumin to creatinine ratio (ACR), and collected socio-demographic, lifestyles and health information (phase 1). After three months (Phase 2), we repeated the urine and blood test as per the Kidney Disease Outcomes Quality Initiative guidelines. The glomerular filtration rate was calculated using the CKD Epidemiology Collaboration equation. Sample size estimation was calculated based on an estimation of the prevalence of CKD in urban Dhaka, Bangladesh; and the final sample size for this study was 928. Statistical analysis was performed using the SPSS ver. 20.0. In the descriptive analysis, continuous variables were expressed as mean ± standard deviation (SD) and categorical variables were expressed as count (percentages). The outcome variable was prevalence of CKD. The exposure variables of CKD were compared with non-CKD individuals. Variables with P-values <0.05 were simultaneously included into the multivariate logistic model and adjusted odds ratios (aORs) and 95% CI were estimated. A probability of less than 0.05 was considered significant.

Result: Among 928 participants, 872 completed the study. In phase 1, probable CKD cases were 281 (32.2%); in phase 2, confirmed cases were 192 (22.0%); of them the prevalence of CKD was 4.0% in stage-1, 11.8% in stage-2, 5.5% in stage-3, 0·6% in stage-4, and 0·11% in stage-5. However, age specific prevalence of CKD was 4.9%, 14.7%, 20.1% and 46.0% among the age group 18-30 years, 31-45 years, 46-59 years and ≥60 years respectively. The multivariate logistic regression analysis revealed that aged ≥60 years (aOR, 5.02; 95% CI, 1.85-13.65), hypertension [3.08 (2.07-4.59)], diabetes [2.52 (1.60-3.96)], anemia [2.50 (1.63-3.84)] and presence of RBC in urine [3.20 (1.71-5.98)] were associated with CKD.

Discussion: The overall CKD prevalence documented in our study (22%) is higher than the pooled prevalence (17.3%) in Bangladesh. These studies are mostly from urban Dhaka, Bangladesh; and the majority of these studies have not repeated serum creatinine and urine ACR measurements over three months to define CKD, as suggested by KDIGO guidelines. This is critical because we identified 281 participants initially with probable CKD and, upon retesting after 3 months, almost 27% proved to be non-CKD individuals. The overall CKD prevalence identified in our study is higher than prevalence of the global, developed and developing countries. Increasing trend of non-communicable diseases (e.g. diabetes, hypertension, stroke), unhealthy lifestyle and dietary behaviors, lack of physical exercise potentially be the key reasons behind our findings. In addition, higher prevalence of CKD among the age group ≥60 years may be the explanation of higher prevalence of CKD in our current study. Our study reported higher odds among the diabetic and hypertensive individuals which is consistent with several previous studies; and might partially contribute to the higher prevalence of CKD in our sample population. In the course of CKD, anemia can occur early and may worsen in advanced stages. We found that anemia is substantially high among CKD patients, which is expected and has also been reported in other studies. Presence of RBC in urine is also documented as a strong factor associated with CKD in our research, which may be attributed to kidney pathology that blocks the urinary tract and triggers decreased kidney function. Although CKD can develop at any time, we found that increasing age particularly aged ≥60 years and older is a risk developing CKD. After the age of 40, kidney filtration starts to decline; and in addition to the natural aging of the kidneys, in elderly, certain diseases including diabetes, high BP, and heart disease that affect the kidneys to become more prevalent to CKD.

Conclusion: Our findings demonstrate that patients living in rural and peri-urban areas have a higher prevalence of CKD in which diabetes, hypertension, anemia, old age, and the presence of RBC in urine all playing a significant role. As a result, scaling up preventative and therapeutic measures to manage these primary risk factors may aid in reducing CKD-related complications.

緒言：慢性腎臓病（CKD）は世界的に、将来の公衆衛生上の脅威と認識されている。特に CKD の有病率は、中低所得国で増加していることから、病期ごとに有病率を評価し、関連する要因を特定するためのコミュニティベースのスクリーニングサービスは、早期の症例発見のための重要な介入となる。

バングラデシュでは、CKD は注目されておらず、健診システムもないことから、ほとんどの住民は自身の腎機能が低下していることを知らず、透析（透析を受けることのできる患者は限定的）又は死に至る。CKD を病期別にスクリーニングするために必要な eGFR（推算糸球体濾過量）の計算式も開発されていないことから、他国の基準を活用している。このような現状のため、CKD（病期分類ごと）の有病率の調査は、首都（ダッカ）での限定的な報告があるのみである。

そのため、今回、共同研究機関である icddr, b（国際下痢性疾患研究センター）が有するサーベイランスシステムを用いて、医療資源が乏しい農村部および都市周辺部に在住する住民に対して、CKD（病期ごと）有病率とその関連要因についてスクリーニング調査を実施し、これを明らかにした。本調査は、続けて実施したCKD重症化予防に向けた地域住民への教育的介入研究（RCT）のベースラインデータとなる。

方法：横断的疫学調査。2020 年 1 月から 6 月にバングラデシュ・タンガイル・ミルザプール地区で実施。調査参加者は 3 つの年齢グループ（18～30 歳、31～45 歳、46 歳）に階層化。Mirzapur Demographic Surveillance System（DSS）データベースを用いて、住民を無作為に抽出。サンプルサイズは、ダッカ都市部のCKD有病率の推定値に基づいて計算（最終的なサンプル数：928）。CKD の診断手順に基づき、血液（血清クレアチニン）・尿検査（尿中アルブミン、Alb：Cre）を実施。1 回目の検査後、さらに 3 か月後に 2 回目の検査を行い、ステージごとの有病率を判定した。関連因子については、CKD の曝露変数を非 CKD 群と比較した。

結果：928 人の参加者のうち、872 人が研究を完了。1 回目の検査では、CKD の可能性のある症例は 32.2%、2 回目調査で 22.0%が CKD と診断された。そのうち、CKD 有病率はステージ 1：で 4.0%、ステージ 2 で 11.8%、ステージ 3 で 5.5%、ステージ 4 で 0.6%、ステージ 5 で 0.11%であった。年齢別有病率は、18～30 歳、31～45 歳、46～59 歳、60 歳以上の年齢層でそれぞれ 4.9%、14.7%、20.1%、46.0%であった。多変量ロジスティック回帰分析の結果、60 歳以上（aOR、5.02; 95%CI、1.85-13.65）、高血圧[3.08（2.07-4.59）]、糖尿病[2.52（1.60-3.96）]、貧血[2.50（1.63 -3.84）]および尿中の RBC の存在[3.20（1.71-5.98）]は CKD と関連していた。

結論：調査の結果、農村部と都市周辺部では都市部に比べて CKD の有病率が高く、糖尿病、高血圧、貧血、老年期および尿中赤血球の存在が関連していることが明らかとなった。これらの主要な危険因子を管理するための予防的・治療的手段を拡大することは、CKD 関連の合併症を減らすのに役立つと考える。