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Short Communication

Use of Short Message Service (SMS) in a Chronic Kidney Disease Screening Programme: A Feasibility Study

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Abstract

Background: Community screening for chronic kidney disease has often been based on single measurements of markers of kidney damage worldwide. The evaluation of kidney dysfunction and related risk factors may be facilitated by the deployment of telehealth services such as short message service.

Methodology: Cross-sectional study for screening participants for CKD and risk factors during a world kidney event at two communities in Calabar, Cross River State. Short message service (SMS) was used to remind and invite participants to attend a kidney clinic to recheck their kidney functions and subsequently adjust initial point prevalence estimates based on this outcome. Chronic Kidney disease was defined as eGFR less than 60ml/min/1.73m^2 and/or proteinuria.

Results: A total of 230 consenting participants were screened with an overall mean age of 36.43 ±11.69 years. 145 (62.7%) were either obese or overweight, while 25 (10.9%), 10 (4.3%) and 1 (0.4%) had a history of hypertension, diabetes, and CKD, respectively. Various degrees of proteinuria were found in 50 (21.74%) participants. Eleven participants had low eGFR <60mL/min. The point prevalence of CKD at the first screening was 24.3% (95%CI 18.9 – 30.4). Of those with either proteinuria or low eGFR, only 12(24%) and 5(45.4%) respectively represented themselves for recheck following the text messages. The adjusted point prevalence was 20.1%.

Conclusion: There is a low level of response to recall for rescreening for urinary and blood markers of kidney disease using mobile phone short message service in our population. The determinants and drivers of response will need to be studied.

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Quick Response Code:

Introduction

Community screening to detect chronic kidney disease (CKD), as well as those at risk of progression to end-stage kidney disease (ESKD), has become a yearly event as part of the World Kidney Day organised by the International Society of Nephrology (ISN). The event is usually marked with educational awareness campaigns and screening for CKD risks such as hypertension, obesity, and diabetes. In addition, serum creatinine and proteinuria tests are undertaken. Such screenings have become more relevant in resource-poor settings where patients present late, healthcare cost is high, and financing is mainly out-of-pocket[1]. Studies have shown low awareness, knowledge, and perception of kidney disease among rural, semi-urban and urban dwellers in Nigeria[2-4]. Placed alongside an inequitable health system exemplified by poor access to health services for disadvantaged populations, it becomes important to set up a kidney disease early detection and mitigation programme for those identified as being at risk of developing CKD. Indeed, given the huge cost of renal replacement therapy (about $80-90 per session of haemodialysis), prevention strategies have become even more imperative.

As of 2020, there were approximately 204 million people with a mobile cellular phone subscription in Nigeria[5]. The present boom in mobile telephony and extensive penetration to rural areas presents an opportunity to use mobile phone services to reach participants who may have proteinuria or low glomerular filtration rate (GFR) at initial screening and invite them for follow-up checks. Patient reminders using mobile phone messaging is an inexpensive medium that has been shown to reduce missed appointments. A recent systematic review has shown that short message service (SMS) led to increased attendance at healthcare appointments[6].

Many community-based screening programmes have reported the burden of CKD based on initial one-off tests only. Proteinuria may be transient and creatinine-based estimated GFR may be dependent on several factors leading to the overestimation of CKD prevalence. Given these shortcomings, we set out to study the feasibility of using a short message service (SMS) to remind and invite participants to attend a kidney clinic to recheck their kidney functions and subsequently adjust initial point prevalence estimates based on this outcome.

Methodology

This was a cross-sectional study for screening participants for CKD and risk factors during a world kidney event at two communities (Esuk Utan and Diamond Hill) in Calabar, Cross River state in 2015. Potential participants were recruited through awareness campaign messages in the mass media (television and radio services). Brief past medical and family histories were taken. Screening for proteinuria was done using the dipstick; blood samples were drawn for creatinine measurement using IDMS-traceable modified Jaffe kinetic reaction; and eGFR was computed using the 2009 Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) equation[7]. Participants with proteinuria and low GFR were contacted via specially composed SMS three months later for a recheck of abnormal parameters. Two messages and two reminders were sent out for this purpose over the course of three months. For both periods, CKD was defined as eGFR less than 60ml/min/1.73m2 and/or proteinuria. Participants were required to give oral consent to participate in the follow-up. Data were analysed using IBM SPSS Statistics for Windows, Version 24.0. Variables are reported as means with corresponding standard deviations and proportions with corresponding 95% confidence intervals.

Results

A total of 230 consenting participants were screened. Of these, 53.5% were females and an overall mean age of 36.43±11.69 years (Table 1). A total of 145(62.7%) were either obese or overweight, while 25(10.9%), 10(4.3%) and 1(0.4%) had a history of hypertension, diabetes, and CKD, respectively. The average systolic blood pressure was 126.2±21.7mmHg, while diastolic blood pressure was 79.4±12.0mmHg. Ninety participants were hypertensive, while 26 were diabetic. Various degrees of proteinuria were found in 50 (21.74%) participants. The mean serum creatinine was 86.63±30.94µmol/L, while the mean eGFR was 103.2±26.18 mL/min/1.73m^2. Eleven participants had low eGFR <60mL/min. The point prevalence of CKD at the first screening was 24.3% (95%CI 18.9 – 30.4). Of those with either proteinuria or low eGFR, only 12(24%) and 5(45.4%) respectively represented themselves for recheck following the text messages. Among those with proteinuria, it persisted in only one participant. Low eGFR persisted in two participants.

Table 1: Sociodemographic and clinical characteristics of study participants

Variable	Results
Age (years)	36.43±11.69
Female Sex	123 (53.48%)
Body Mass Index (Kg/m2)	26.93±4.98 (Male-25.18±3.67; female-28.42±5.45)
Previous hypertension history	25 (10.87%)
Previous Diabetes Mellitus history	10 (4.34%)
Previous Chronic Kidney Disease history	1 (0.43%)
Family history of Hypertension (n)	42 (18.26%)
Family history of Diabetes (n)	14 (6.09%)
Family history of CKD (n)	3 (1.30)
Hypertension (%)	37.82% (95% CI 31.53-44.44%)
Diabetes Mellitus (%)	4.78% (95% CI 2.41-8.40%)
Systolic Blood Pressure (mmHg)	126.2 ±21.4 mmHg
Diastolic Blood Pressure (mmHg)	79.4 ± 12.0 mmHg
Mean Arterial Blood Pressure(mmHg)	95.0 ± 14.3
Dipstick Proteinuria (%)	21.74(95%CI 16.59-27.64%)
Overweight prevalence (%)	33.3 (95% CI 27.0-40.1%)
Obesity prevalence (%)	26.3 (95% CI 20.5 - 32.7%
$eGFR_{CKD-EPI}$ (ml/min/1.73m^2)	103.20 ± 26.18
eGFR<60ml/min/1.73m^2	3.70% (95%CI 1.50-7.48%)

Discussion

In this cross-sectional exploratory study, we have demonstrated a significantly high prevalence of risk factors for chronic kidney disease, including hypertension, obesity/overweight and diabetes, as well as a remarkably high point-prevalence of kidney dysfunction exemplified by proteinuria and low eGFR at the first screening. In addition, there is a low level of response by participants to recall for re-screening for urinary and blood markers of kidney disease using mobile phone short message service. Despite this, there appears to be a lower prevalence of CKD when compared with initial estimates since proteinuria persisted in only one participant out of the original 50 representing a 91.7% remission three months later.

Short message service (text message) is a common, cheap, easy-to-use, and convenient mode of communication that can be deployed to reach large populations at once. As of 2022, mobile and cellular subscriptions stood at 91 per 100 inhabitants in Nigeria[8], suggesting that this might be a valuable modality for following up with people to achieve positive population health outcomes. Risk factors for CKD are prevalent in both the urban and rural populations in Nigeria and the high mobile and cellular penetration can

be leveraged to deliver lifestyle-based messages and follow-up with patients at risk. Studies elsewhere involving patients with hypertension and targeting lifestyle-based SMS intervention have demonstrated positive outcomes as well as acceptability of the option[9]. The reasons for such poor response to reminders for re-screening by our patients may be related to several factors; poor health-seeking behaviour, the long duration of three months from initial screening with likely competing demands for the time in the intervening period, and poor literacy of the participants such that the messages may not have been read. Health-seeking behaviour is a multidimensional concept with context-specific determinants[10]. In relation to NCDs in our environment, educational status, income, and occupation have been found to positively influence the utilization of formal healthcare service[11,12]. It may well be that coupling lifestyle-based messages on the recall reminders may have elicited a more robust response from participants.

Telehealth is increasingly becoming a preferred option for delivering health promotion, education, training, and advice to patients for optimal health outcomes. Text messages (a form of telehealth) are very accessible even to vulnerable and disadvantaged groups and their utility has been demonstrated in several maternal, child health and infectious diseases programmes although some of the evidence is limited by the heterogeneity of included studies[13,14]. The setting up of an early detection and evaluation programme for CKD can incorporate this service as a follow-up to an initial face-to-face delivery of life-style based advice using educational, information and communication materials to encourage the response for follow-up check for confirmation of CKD. Upon confirmation, eHealth interventions including SMS that target people with established CKD may be considered for use to achieve positive outcomes although now, the evidence is of low quality and the effects are uncertain[15].

This exploratory study is limited by the small sample size, especially for those who returned and the absence of comparative data that may have suggested determinants of response.

Conclusions

There is a low level of response to recall for rescreening for urinary and blood markers of kidney disease using mobile phone short message service in our population. The determinants and drivers of response will need to be studied.

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Conflicts of interest: None

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