Prevalence and risk factors for CKDu in the district of Anuradhapura

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World Health Organization

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Executive summary

Chronic kidney disease of unknown aetiology (CKDu) has been identified in Sri Lanka in the early 1990s in the Anuradhapura District. This was mainly observed among male farmers in their middle age. Later, the disease was identified in 11 districts in the country, and routine screening programmes were commenced by the Ministry of Health to identify and refer individuals in the early stages of the disease. However, there has been a lack of population-based data, based on random population surveys with high response rates. Therefore, none of the available sources provides accurate estimates of the burden of the disease or time trends. Several hypotheses have been suggested as to the cause of the CKDu, but none have been fully investigated or scientifically established.

In 2016, the Epidemiology Unit of the Ministry of Health, National Science Foundation (NSF) and World Health Organization (WHO) Country Office for Sri Lanka collaborated to develop an operational case definition for CKDu in Sri Lanka, and to develop a survey protocol to estimate the burden, geographical distribution and time trends of CKDu in Sri Lanka. This resulted in a three-level case definition, namely suspected, probable and confirmed CKDu, which was published by the Ministry of Health in December 2016; it also resulted in the development of the protocol for the present survey. The objectives of the survey in five areas in Anuradhapura District were to: (i) estimate the prevalence of Suspected CKDu; (ii) describe the distribution of the levels of estimated Glomerular Filtration Rates (eGFR); and (iii) investigate the risk / protective factors for Suspected CKDu.

The protocol of the present survey was based on the published international protocol for the DEGREE study, which is a standardized protocol that is currently also being used to investigate CKDu in other countries internationally.

A community-based cross-sectional household survey was carried out in 5 areas in Anuradhapura district. The methods used in each area followed the international protocol for the DEGREE study. These areas were selected using the existing data generated through routine screening programmes by the Ministry of Health to identify areas where it was believed that the prevalence levels were high, moderate and/or low. All the adults above the age of 18 years whose main place of residence for the past 6 months (usually living in

the area for at least for 5 days of the week during the past 6 months) was in the study area were eligible to be included in the study. Exclusion criteria were pregnant women and patients undergoing treatment for cancers. The study aimed to recruit 1000 eligible study participants from each of the study areas, as specified in the DEGREE protocol. Recruitment of study participants was done through a household survey. Upon recruitment, the pre-tested questionnaire was administered by trained graduates in health promotion. The study participants were then invited to a 'clinic' on the following morning with an early morning urine sample. In the clinics, height, weight, body composition, random blood sugar and blood pressure were measured using the specified instruments and protocols. Trained science graduates from the Rajarata University and retired nurses conducted the clinic procedures. All the participants were assigned a unique id number. Blood and urine samples were transported in cool boxes, while keeping the temperature at 2-8 ^{o}C, and were analyzed at Chemical Pathology Department at Teaching Hospital, Anuradhapura on the same night. IDMS quality standards were adhered to in the assessment of the serum creatinine, and aliquots were also separated for bio-banking purposes. Field and clinic data collection was supervised by the members of the research team and all the laboratory tests were done under the supervision of the Consultant Chemical Pathologist. Data entry was done using the Epidata software.

The overall response rate was 88.7%; the response among females (90.4%) was higher than in males (85.4%). The study included more females (68.2%): fewer males in the study area were eligible to be included in the study than were females as more males were employed in occupations which made them live outside their residences during the 6 months period prior to the study.

The overall prevalence of Suspected CKDu was found to be 13.3%, with the male prevalence being significantly higher than in females (Male, 19.9%; Female, 10.5%). However, these estimates were based on excluding 'probable hypertension cases'; if 'possible hypertension cases' were also excluded, this reduced the prevalence estimate for suspected CKDu by almost a quarter, from 13.3% to 9.5% (Male-14.2%, Female- 7.5%). The prevalence of CKD with a known cause for CKD as identified by the present survey (i.e. excluding those classified as 'Suspected CKDu' (hypertension on treatment with more than two drugs OR

untreated blood pressure of more than 160/100 mmHg AND/OR diabetes mellitus -history of diabetes OR being on treatment OR capillary random plasma glucose >200 mg/dL)) was 6.7% (Male – 8.6%, Female – 5.8%).

Out of the all five study areas, "Puhudivula" showed a statistically significant lower level of mean eGFR. However, the mean eGFR levels of males in all five areas were similar. In three out of five areas, males showed significantly lower mean eGFR compared to females in the same areas.

Being in the age categories of 41 – 50years, 51 – 60 years, 61-70 years and > 70 years, currently not married, ever smoking, history of CKD among parents or siblings and both farming for >10 and < 10 years were significant predictors for decreasing eGFR when adjusted for the effect of confounding was seen in both males and females.

Being a male showed a significantly higher risk for Suspected CKDu.
Being in the age categories of 41-50 years, 51-60 years, 61-70 years and > 70 years was a significant risk factor for Suspected CKDu when adjusted for the effect of confounding in both sexes.

Lesser number of years of education in schools and in higher education institutes, ever smoking, ever use of smokeless tobacco, high body water %, farming for ≥ 10 years and working outside the sun 20 hours or more per week were risk factors for Suspected CKDu only among males when adjusted for the effect of confounding while none were found to be the risk factors for Suspected CKDu only among females.

The environmental exposures and occupational related factors studied in the present survey were based on self-reports and were proxy measures. Overall, farming was the main occupational/environmental risk factor for Suspected CKDu. Particular exposures associated with farming (e.g. pesticide exposure, heat exposure) did not appear to explain the increased risk from farming, but the available exposure information was limited, and these findings may change when better exposure data are obtained. It should be noted that the present study adopted a cross-sectional design which does not allow the examination of the

temporal relationship between the identified significant risk/protective factors and the Suspected CKDu status.

We recommend further surveys in other districts of the country using the same protocol to estimate the prevalence of Suspected CKDu to better understand the burden and distribution of the problem.

The modifiable risk factors identified in this study are recommended to be used in the ongoing primary or secondary preventive activities.

The environmental exposures and occupational related factors studied in the present survey were based on self-reports and were proxy measures and the cross-sectional design used precluded assessment of the temporal relationship of the identified risk factors. Thus, it is recommended that a prospective cohort study is conducted using quantitative measurements of environmental exposures including agrochemical residues, weedicides and pesticides, heat exposure, heavy metals in water, and infections.

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1 Introduction

1.1 Background

Chronic kidney disease of unknown aetiology (CKDu) is one of the diseases of public health importance in Sri Lanka, affecting predominantly farmers. Either all or few of the Divisional Secretariat Divisions of 11 districts (out of 25 districts) in the country (Anuradhapura, Polonnaruwa, Kurunegala, Ampara, Trincomalee, Badulla, Mullaitivu, Vavuniya, Matale, Monaragala, Hambanthota) have been designated as 'at risk' for the occurrence of CKDu. Though perceived by many to be a disease of high prevalence and with trends of increasing prevalence, none of the current sources of data in the country allows for accurate estimation of the burden and trends of CKD or CKDu in the country. Routine morbidity and mortality surveillance through hospital statistics and vital registration systems does not have a specific category for CKD or CKDu. Community-based screening programmes in areas designated as 'high risk' have had challenges of low coverage and lack of exposure-related data. The special household survey that has been conducted in the designated 'high risk' areas in 2015, collected information only on the diagnosed CKD/ CKDu patients and did not include a method to identify the early asymptomatic cases, precluding the use of the data to estimate the prevalence of CKD/CKDu. Data of CKD patients in the Provincial Renal Disease Prevention and Research (PRDPR) Unit was restricted to the North-Central Province of the country. Though this database was derived from household data and included some exposure data, the period of data collection ranged from 2003 to the current time with no updating to exclude deaths. Furthermore, none of the sources of data is designed to generate information to formulate hypotheses that could guide further research to identify the causes of CKDu.

World Health Organization (WHO) Country Office for Sri Lanka and Presidential Task Force jointly convened a three-day international expert consultation in April 2016 which recommended a survey to understand the burden, geographical distribution and time trends of CKDu in Sri Lanka. It was recommended that the results should provide a platform for long-term research to understand the role of potential risk factors and document the usefulness of ongoing interventions.

To take forward the recommendations, National Science Foundation (NSF) and the World Health Organization (WHO) Country Office for Sri Lanka jointly organized a two-day workshop on 24th and 25th October 2016. The participants comprised nephrologists, physicians, clinical researchers, non-medical researchers, epidemiologists, program managers at the national/province level and international experts. The workshop provided a platform to brainstorm and develop a case definition and a survey protocol to understand the burden, geographical distribution and time trends of CKDu in Sri Lanka. The participants agreed upon a three-level case definition namely suspected, probable and confirmed CKDu The Ministry of Health issued an official communication (EPID 449 (v)/2016 dated 24 December 2016) (Annexure I) requesting all health professionals to use the case definition at different levels of health system for the purpose of screening, patient management and in record keeping. The responsibility for designing and implementing the survey was handed over to the Epidemiology Unit in the Ministry of Health. The funding support was provided by the National Science Foundation (Grant Number: RPHS/2016/CKDu 07). The protocol for the proposed survey was based on the international protocol for the DEGREE study (Caplin et al, 2017) which is a published standardized protocol offering a scientifically rigorous method to be followed in surveys assessing burden due to CKDu.

This survey was undertaken to fulfil the need to understand the burden, geographical distribution and time trends of CKDu and follows the protocol agreed upon at the workshop. The survey was conducted in five study areas in the district of Anuradhapura. It is the district which records the highest numbers of patients with CKDu in Sri Lanka since the recognition of the problem in the 1990s.

1.2 Objectives

To estimate the prevalence of Suspected CKDu[1] in the study areas

To estimate the prevalence of CKD in the study areas

To describe the distribution of the levels of estimated Glomerular Filtration Rates among the study participants in the study areas

To determine the risk / protective factors for Suspected CKDu in the study areas

[1] Criteria used to classify study participants as Suspected CKDu in the Case definition in Sri Lanka.

Essential criteria: eGFR < 60 mL/min using CKD EPI equation: One time measurement using standardized methods for creatinine measurement AND/OR albuminuria > = 30 mg/g

Exclusion criteria to identify suspected CKDu among those satisfying above criteria

i. Urine protein: creatinine ratio > 2 g/g creatinine OR urine albumin: creatinine ratio >0.3 g/g creatinine
ii. Hypertensive on treatment with more than two drugs OR untreated blood pressure of more than 160/100 mmHg (preferably using electronic BP apparatus, sitting position, at least two readings one minute apart)
iii. History of diabetes OR being on treatment OR capillary random plasma glucose >200 mg/dL

2 Methods

2.1 Study design

This was a community-based cross-sectional household survey.

2.2 Study settings

The study was conducted in five areas in the district of Anuradhapura. In selecting the five study areas, Anuradhapura district was stratified into three categories as highly endemic, moderately endemic and low level of endemicity based on the data from the latest routine screening programmes conducted by the Ministry of Health, Nutrition and Indigenous Medicine, Sri Lanka. It was decided that the study include one area from a low endemic area and two areas each from moderate and high endemic areas. The data from the screening programmes were available for the grama niladhari divisions (GND), which is the lowest level of the administrative unit in the country. Whenever the GN areas did not record the required number of 1000 eligible study participants, geographically bordering adjacent villages from the adjoining GND was included so that each study area has a base population of 1000. Thus, the study area was defined as a GN area and parts of adjacent villages (Table 2.1).

Figure 1: Area map of the study area

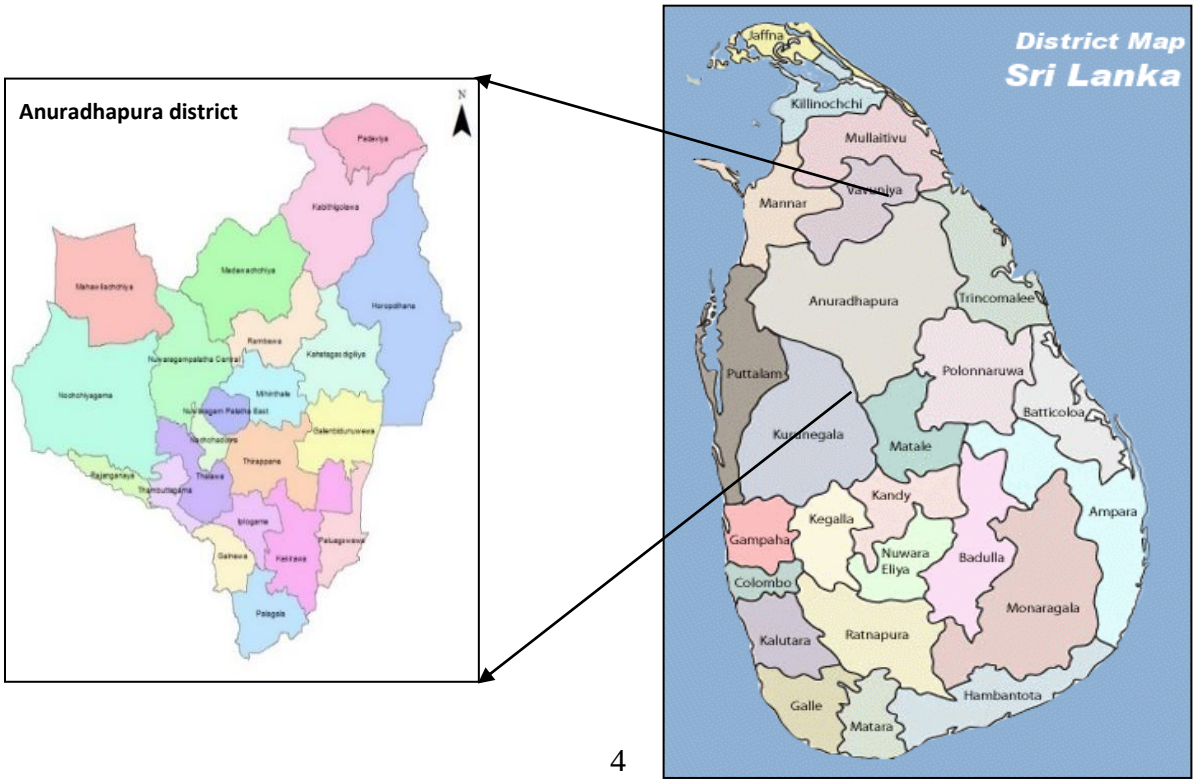


Table 2.1: The study areas included in the survey

Study areas	Endemicity based on the data of the latest routine screening programs
Area 1- Pothana GN area and parts of two adjacent villages	Low
Area 2- Sangilikanadarawa and parts of three adjacent villages	Moderate
Area 3- Halambagaswewa GN area and parts of two adjacent villages	High
Area 4- Puhudivula GN area and parts of three adjacent villages	High
Area 5- Lolugswewa GN area and parts of one adjacent village	Moderate

2.3 Study population

All the adults above the age of 18 years whose main place of residence for the past 6 months (usually living in the setting for at least for 5 days of the week during the past 6 months) was in the study area were included in the study. Exclusion criteria were pregnant women and patients undergoing treatment for cancers.

2.4 Sample size and sampling technique

A sample of 1000 eligible study participants was estimated to be included from each of the study areas so that it aligns with the sample size specifications of the DEGREE protocol (Caplin et al, 2017). It was noted that this sample size will allow reasonably accurate estimates of the prevalence of, suspected CKDu, CKD, mean eGFR in each study area and would also have sufficient statistical power to determine risk factors for suspected CKDu and for comparisons between study areas or between population subgroups.

The five study participants were selected on the basis that resident eligible study participants to be approximately 1000 in each of the setting. All the eligible study participants in the defined study area were invited to participate in the study.

2.5 Study instruments

An array of data collection tools were used to obtain data required to achieve the specific objectives.

The status of CKD and CKDu required measurements of serum creatinine, albuminuria, capillary glucose and blood pressure as well as inquiries into the past medical history of diabetes mellitus, hypertension and its treatment.

Risk factors assessed were identified based on a review of studies and hypotheses that have been proposed in Sri Lanka and other countries. Views of the residents of the study areas on potential risk or protective factors were also obtained through qualitative inquiries and were incorporated.

The main groups of risk factors assessed were:

i. Socio-demographic characteristics
ii. Occupational and behavioural risk factors, dietary habits, history of pre-existing diseases, family history of diseases, exposures relevant to local context and concerns of communities
iii. Anthropometric measurements- body mass index, percentage of body water, percentage body fat

Laboratory testing was performed on biological samples for assessment of serum creatinine and albuminuria while onsite measurements were performed for capillary glucose and blood pressure and anthropometry indices. Information on socio-demographic characteristics and other potential risk factors were collected using an interviewer-administered questionnaire.

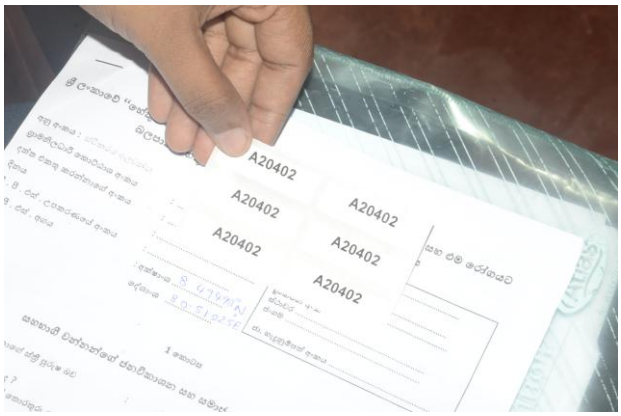
2.6 Data collection

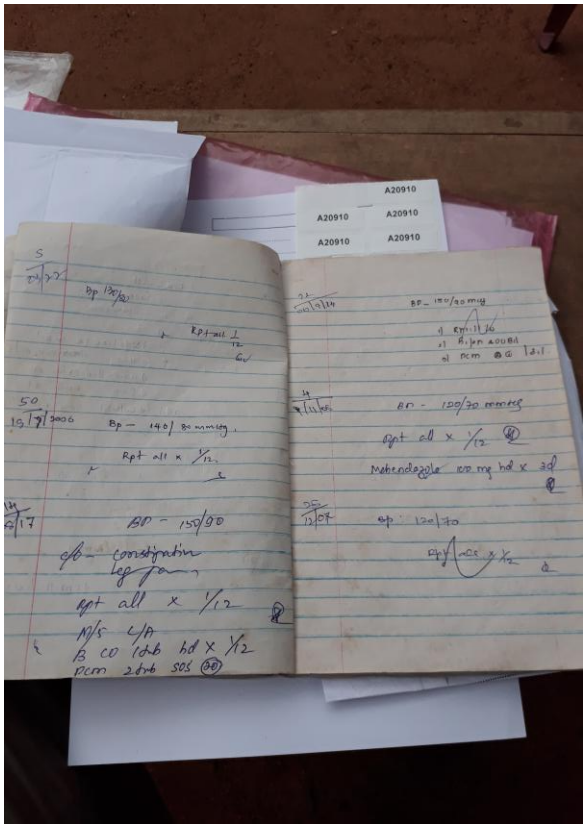
Two retired Public Health Inspectors were recruited as the field coordinators. The voter's lists served as the frame to identify the eligible study participants. The field coordinators liaised with the relevant Grama Niladharis to identify the numbers of eligible study participants of the specified GN areas and the adjacent villages. They coordinated with the village leaders and the community-based societies on measures to be adopted to promote the participation of the eligible study participants. A team of ten graduates of health

promotion from the Rajarata University were trained to recruit the study participants by visiting each of the houses in the study area and to administer the questionnaires.



All recruited study participants were issued a unique identifying number. The individual-level data from the recruited study participants were collected using the Sinhalese version of the interviewer-administered questionnaire (Annexure II). The medical treatment records were also photographed so that the data collected can be verified later by a medical doctor. Upon completion of the questionnaire, the study participants were instructed on collecting the early morning urine sample and to visit the 'clinic' on the following day before work for the anthropometry measurements and biological sample collection. Revisits to the houses were done to recruit any eligible study participants who were not available in the house at the time of the first visit.



The ‘clinics’ were set up in each village in locations that were acceptable and accessible to all the villagers. A retired Public Health Inspector was recruited to coordinate the clinic data collection. A team of ten undergraduates of the Science stream of the Rajarata University and three retired nurses were trained to perform the data collection in the clinic areas. In the clinics, the urine sample collected by the study participants were taken over and a sample of 3 ml of blood was drawn. The blood samples were centrifuged on-site using a portable centrifuge and the centrifuged blood sample and the urine samples were stored in an igloo which was maintained at a temperature of 2-8 ^{o}C. The trained science undergraduates performed the measurements of blood pressure (three times five minutes apart using electronic BP apparatus, sitting position), capillary random plasma glucose using a glucometer, height using stadiometer, bio-impedance outputs of body fat %, BMI and total body water % using a TANITA SC-240MA Body composition analyzer. The records of all these measurements are recorded in a ‘clinic’ data sheet (Annexure III).








The 'clinic' coordinator ensured proper storage and transport of biological samples to the chemical pathology laboratory of the Anuradhapura Teaching Hospital after each clinic session. In the laboratory, samples of serum (total of 2 ml stored as a single aliquot) and urine (2ml in one aliquot) were separated for bio-banking purposes and was stored in -20C freezer.

Serum creatinine and urine protein: creatinine ratio was tested in the laboratory of the Anuradhapura Teaching Hospital by a team of four medical laboratory technicians on the same night. Serum creatinine was measured using assays calibrated utilizing quality controls traceable to isotope dilution mass spectrometry (IDMS) standards. The reports were generated by the machine and carried the unique identification number of each study unit. The laboratory procedures were supervised by the Chemical Pathologists who is a member of the research team.

A data entry form was created in Epidata package with relevant checks, and four data entry operators were recruited to enter the data of the questionnaire, body measurements and laboratory reports, linked to the unique identifying number. A medical doctor was trained to interpret photographs of medical and treatment histories and enter the verified data into the relevant data sheets. Double entry of data was performed for data on serum creatinine and albuminuria of all study participants. The investigator performed double entry of randomly selected clinic data and information obtained through the questionnaires to assess and to ensure the quality of data entry.

Prior to data collection, a one-day training session was conducted for the field and 'clinic' coordinators, data collectors, those who performed 'measurements, nurses and for the data entry operators. The training included a session of mock data collection in a similar setting.

2.7 Ethical considerations

Institutional ethics committee approval was obtained from the Ethics Review Committee of the Faculty of Medicine, University of Colombo (EC-17-031). All reports were shared by the study participants. All those classified as Suspected CKDu, CKD, hypertension and diabetes were referred to the nearest hospital for treatment.

2.8 Data analysis

The background characteristics of the study participants in terms of socio-demographic characteristics, biological features, behaviour related variables (alcohol use, tobacco use, food consumption patterns, water drinking patterns) and occupationally related variables

(engaging in different types of farming, exposure to chemicals) were described using frequency distributions.

Prevalence of Suspected CKDu[1] by sex and study areas, along with 95% confidence intervals (CI) was estimated using those that fulfilled the existing case definition as the numerator and those at risk as the denominator. Sex-adjusted **Prevalence of Suspected CKDu** was also estimated for each study area.

Furthermore, the following estimate of the prevalence of Suspected CKDU was also done by varying the exclusion criteria of hypertension and diabetes or varying the combinations of exclusion criteria used.

- Using only the exclusion criteria of hypertension as in the existing case definition
    - Using only the exclusion criteria of 'Possible Hypertension' BP more than 140/90 at the time of the survey
    - being on anti-hypertension drugs (any number)
    - Self-reported as having hypertension with evidence of medical records

- Using the exclusion criteria of 'Possible hypertension' and diabetes

Prevalence of **known cause CKD** by sex and study areas, along with 95% CI were estimated using those with essential screening criteria (eGFR < 60 mL/min using CKD EPI equation AND/OR albuminuria >= 30 mg/g) and a known cause for CKD as identified by the present survey (hypertension on treatment with more than two drugs OR untreated blood pressure of more than 160/100 mmHg AND/OR diabetes mellitus -history of diabetes OR being on treatment OR capillary random plasma glucose >200 mg/dL) as the numerator and all the study participants as the denominator.

Furthermore, an analysis of how the two features of the essential criteria are distributed among the study participants is also presented. The combinations used are as follows.

- eGFR <60mL/min with or without albuminuria ≥30mg/g creatinine
- albuminuria ≥30mg/g creatinine with or without eGFR <60mL/min
- eGFR <60mL/min without albuminuria ≥30mg/g creatinine

Mean and SD of eGFR was described by study area and sex. Based on eGFR levels, the study participants were classified into categories that correspond to Stages of CKD and frequency distribution is presented.

The analyses for the age and sex-adjusted associations of mean eGFR and potential risk factors for Suspected CKDu excluded the study participants who were positive for essential screening criteria (eGFR < 60 mL/min using CKD EPI equation: One time measurement using standardized methods for creatinine measurement AND/OR albuminuria > = 30 mg/g) with a known cause for CKD (n=199) as identified by the present survey.

Bivariate analyses for age and sex-adjusted associations of mean eGFR were estimated using coefficients along with 95% CI, while the age and sex-adjusted associations with Suspected CKDu were estimated in terms of univariate Odds Ratios (OR) and 95% CI.

In the analysis of potential risk factors, self-reported information was operationalized as indicated below.

- Farming: the variables on engagement of any farming as a full time or part time occupation were combined with the reported duration to classify the respondents into five groups (no farming, part-time farming for <10 years, part-time farming for ≥10 years, full time farming for <10 years and full time farming for ≥10 years) and as three groups (no farming, farming less than 10 years and farming 10 or more years)
- Exposure to chemical fertilizers, weedicides or pesticides: Those who reported non-rare exposure (sometimes or often) to chemical fertilizers, weedicides or pesticides for at least five years in the past were classified as being exposed.
- Exposure-specific sources of drinking water: The respondents were classified as having been exposed to a particular drinking water source if they ranked the source as one of the top three most frequently used for more than 10 years in the past.
- Exposure to heat: those who reported > 20 hours of outdoor work per usual day and days per usual week in the sunlight were considered as exposed.
- Amount of drinking water consumed: Those who reported consuming less than 3 l of water on a usual day were considered as exposed.

- Exposure to specific food items: When classifying respondents as having been exposed for the food items, those that had been consumed the specific food item s 3 or more days during the week prior to the survey were considered as exposed.

Multiple linear regression was used to estimate adjusted predictors of mean eGFR using multiple linear regression, while adjusted risk/protective factors of suspected CKDu were determined using multiple logistic regression.

3 Results

Table 3.1 shows the male, female and overall response rate of the study population.

Table 3.1: Distribution of the Male, Female and Overall Response Rate of the Study Population

	Area 1	Area 2	Area 3	Area 4	Area 5	Total
	Pothana GN area and parts of two adjacent villages	Sangilikanadarawa and parts of three adjacent villages	Halambagaswewa GN area and parts of two adjacent villages	Puhudivula GN area and parts of three adjacent villages	Lolugswewa GN area and parts of one adjacent village	
Estimated number of eligible males	353	390	355	348	344	1790
Number of eligible males included	290	340	313	300	286	1529
Response rates among males	82.15	87.18	88.17	86.21	83.14	85.42
Estimated number of eligible females	678	727	670	752	779	3619
Number of eligible females included	618	668	613	700	675	3274
Response rate among females	91.13	91.88	91.44	93.13	86.67	90.46
Estimated number total residents	1031	1117	1025	1100	1123	5409
Number of eligible residents included	908	1008	926	1000	961	4803
Overall Response rates	88.06	90.24	90.34	90.91	85.57	88.79

The total study included 4803 participants with an overall response rate of 88.7%. The response rate among the eligible females (90.4%) was higher than the males (85.4%). All the areas recorded very high response rates (88%-91%).

Table 3.2 shows the distribution of the basic socio-demographic characteristics of the study population.

Table 3.2: Distribution of the Study Population by Socio-demographic Characteristics and Study Areas

Socio-demographic characteristics	Area 1		Area 2		Area 3		Area 4		Area 5		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Age categories (in completed years) (n=4803)												
18 – 30	140	15.4	167	16.6	164	17.7	166	16.6	137	14.3	774	16.1
31 – 50	378	41.6	483	47.9	432	46.7	455	45.5	477	49.6	2225	46.3
51 – 70	337	37.1	320	31.7	281	30.3	322	32.2	313	32.6	1573	32.8
> 70	53	5.8	38	3.8	49	5.3	57	5.7	34	3.5	231	4.8
Sex (n=4803)												
Male	290	31.9	340	33.7	313	33.8	300	30.0	286	29.8	1529	31.8
Female	618	68.1	668	66.3	613	66.2	700	70.0	675	70.2	3274	68.2
Ethnicity (n=4803)												
Sinhala	884	97.4	1004	99.6	925	99.9	999	99.9	959	99.8	4771	99.3
Tamil	02	0.2	00	0.0	00	0.0	00	0.0	00	0.0	09	0.2
Muslim	01	0.1	04	.4	01	0.1	01	0.1	2	.2	02	0.0
Other	21	2.3	0	0.0	00	0.0	00	0.0	00	0.0	21	0.4
The highest level of education (n=4803)												
Never gone to school	70	7.7	40	4.0	62	6.7	34	3.4	32	3.3	238	5.0
Grade 1 – 5	158	17.4	151	15.0	154	16.6	164	16.4	145	15.1	772	16.1
Grade 6 – 11	355	39.1	451	44.7	463	50.0	507	50.7	485	50.5	2261	47.1
Passed G.C.E O/L	190	20.9	211	20.9	141	15.2	187	18.7	184	19.1	913	19.0
Passed G.C.E. A/L	122	13.4	131	13.0	96	10.4	102	10.2	104	10.8	555	11.6
Certificate/Diploma	01	0.1	03	0.3	06	0.6	01	0.1	00	0.0	11	0.2
Graduate	12	1.3	21	2.1	04	0.4	05	0.5	11	1.1	53	1.1

Number of years of education in schools and in higher education institutes (n=4803)												
No schooling	70	7.7	40	4.0	62	6.7	34	3.4	32	3.3	238	5.0
< 10	302	33.3	336	33.3	310	33.5	361	36.1	341	35.5	1650	34.4
≥ 10	536	59.0	632	62.7	554	59.8	605	60.5	588	61.2	2915	60.7
Marital status (n=4779*)												
Married	760	83.7	833	82.6	774	83.6	835	83.5	792	82.4	3994	83.2
Unmarried	69	7.6	65	6.4	62	6.7	65	6.5	65	6.8	326	6.8
Divorced	9	1.0	4	0.4	6	0.6	01	0.1	07	0.7	27	0.6
Widowed	65	7.2	103	10.2	78	8.4	94	9.4	92	9.6	432	9.0
Average family monthly income (n=4803)												
Less than Rs.10,000	184	20.3	178	17.7	185	20.0	233	23.3	221	23.0	1001	20.8
Rs. 10,001-20,000	240	26.4	213	21.1	168	18.1	186	18.6	148	15.4	955	19.9
Rs. 21,001-30,000	181	19.9	183	18.2	177	19.1	157	15.7	176	18.3	874	18.2
Rs. 31,001-40,000	119	13.1	207	20.5	187	20.2	250	25.0	265	27.6	1028	21.4
Rs. 41,001-50,000	74	8.1	95	9.4	94	10.2	88	8.8	78	8.1	429	8.9
Rs. 51,001-60,000	48	5.3	61	6.1	66	7.1	43	4.3	44	4.6	262	5.5
More than Rs.60,000	62	6.8	71	7.0	49	5.3	43	4.3	29	3.0	254	5.3

* Marital status missing in 24 subjects

Nearly half of the study participants were in the age category of 31-50 years. Of the study population, a majority were females (68.2%). The study included only the adults above the age of 18 years whose main place of residence for the past 6 months (usually living in the setting for at least for 5 days of the week during the past 6 months) was in the study area. The fact that the response rates among males were fairly high in spite of the lower proportions can be explained by the fact that fewer males were eligible to be included in the study compared to females. Anuradhapura district is a district from which many males get enlisted in the Armed Forces, which means that their main place of residence is not in their homes. Similarly, many adult males in the district are also known to have migrated to urban areas for employment and were ineligible to be included in the study.

Almost all (99.3%) of the study participants were Sinhalese. The highest level of education for nearly half of the study population was secondary schooling (47.1%) with only a minority (5%) reported not receiving any formal school education. Comparison with the data of

population characteristics of the country in the latest population Census of 2012, showed that in Sri Lanka the proportions who had completed the secondary education and those who had not received any formal education were was 58.7% and 4.7%, respectively (Depart of Census and Statistics, 2012). Approximately one-fifth of the study population was seen to occupy each of the four lower family monthly income categories within the ranges of <10,000 LKR to 40,000 LKR. The household income expenditure survey 2016 indicates a mean and median nominal household income per month of Rs. 58,326 and Rs. 41,629 respectively. The corresponding figures for the country were Rs.62,237 and Rs. 43,511.

The study population by employment status and ever occupation in farming is shown in Table 3.3 while tables 3.4 and 3.5 show the study population by the duration of engagement in different types of farming of males and females, respectively.

Table 3.3: Distribution of the Study Population by Employment Status and Ever Occupation in Farming and Study Areas

Employment Status	Area 1		Area 2		Area 3		Area 4		Area 5		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Current employment (n=4803)												
Full-Time – Public Sector	42	4.6	93	9.2	73	7.9	102	10.2	92	9.6	402	8.4
Full Time- Private Sector	35	3.9	58	5.8	38	4.1	18	1.8	16	1.7	165	3.4
Self-Employed	282	31.1	271	26.9	346	37.4	340	34.0	325	33.8	1564	32.6
Casual Employment	155	17.1	121	12.0	88	9.5	132	13.2	136	14.2	632	13.2
Student	5	0.6	15	1.5	11	1.2	11	1.1	12	1.2	54	1.1
Unpaid Family Work	62	6.8	53	5.3	25	2.7	28	2.8	25	2.6	193	4.0
Retired	39	4.3	35	3.5	38	4.1	29	2.9	46	4.8	187	3.9
Unemployed	288	31.7	362	35.9	307	33.2	340	34.0	309	32.2	1606	33.4
Ever occupied in farming (n=4803)												
Full time farming	444	48.9	391	38.8	435	47.0	482	48.2	486	50.6	2238	46.6
Male	131	45.2	124	36.5	149	47.6	125	41.7	122	42.7	651	42.6
Female	313	50.6	267	40.0	286	46.7	357	51.0	364	53.9	1587	48.5
Part time farming	299	32.9	295	29.3	255	27.5	280	28.0	248	25.8	1377	28.7

Male	123	42.4	147	43.2	122	39.0	140	46.7	127	44.4	659	43.1
Female	176	28.5	148	22.2	133	21.7	140	20.0	121	17.9	718	21.9
No	165	18.2	322	31.9	236	25.5	238	23.8	227	23.6	1188	24.7
Male	36	12.4	69	20.3	42	13.4	35	11.7	37	12.9	219	14.3
Female	129	20.9	253	37.9	194	31.6	203	29.0	190	28.1	969	29.6

A great majority of males (85.7%) were ever occupied in farming with equal proportions reporting full time (42.6%) and part-time (43.1%) engagement. Among females, those ever occupied in full-time farming was similar to males (48.5%) while those who reported part-time engagement was approximately half compared to males (21.9%). Nevertheless, a great majority (69.8%) were ever occupied in farming even among females.

Table 3.4: Distribution of the Male Study Population by the Duration of Engagement in Different Types of Farming and Study Areas

Variable	Area 1		Area 2		Area 3		Area 4		Area 5		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Duration of any type of farming (n=1529)												
No farming	36	12.5	69	20.4	42	13.4	35	11.7	37	13.0	219	14.4
< 10 yrs	50	17.4	58	17.1	50	16.0	45	15.1	48	16.9	251	16.5
≥ 10 yrs	202	70.1	212	62.5	221	70.6	219	73.2	199	70.1	1053	69.1
Duration of paddy farming (n=1529)												
No paddy farming or no farming	58	20.0	88	25.9	46	14.7	48	16.0	43	15.0	283	18.5
< 10 yrs	45	15.5	50	14.7	48	15.3	39	13.0	46	16.1	228	14.9
≥ 10 yrs	187	64.5	202	59.4	219	70.0	213	71.0	197	68.9	1018	66.6
Duration of vegetable farming (n=1529)												
No vegetable farming or no farming	238	82.1	276	81.2	241	77.0	206	68.7	190	66.4	1151	75.3
< 10 yrs	12	4.1	8	2.4	16	5.1	13	4.3	22	7.7	71	4.6
≥ 10 yrs	40	13.8	56	16.5	56	17.9	81	27.0	74	25.9	307	20.1

Duration of chena cultivation (n=1529)												
No Chena farming no farming	62	21.4	180	52.9	105	33.5	111	37.0	85	29.7	543	35.5
< 10 yrs	43	14.8	29	8.5	25	8.0	22	7.3	33	11.5	152	9.9
≥ 10 yrs	185	63.8	131	38.5	183	58.5	167	55.7	168	58.7	834	54.5
Ever occupied in any farming and duration (n=1529)												
No	36	12.4	69	20.3	42	13.4	35	11.7	38	13.3	220	14.4
Part time farming for < 10 yrs	40	13.8	47	13.8	33	10.5	31	10.3	39	13.6	190	12.4
Part time farming for ≥ 10 yrs	87	30.0	99	29.1	89	28.4	110	36.7	89	31.1	474	31.0
Full time farming for < 10 yrs	12	4.1	12	3.5	17	5.4	15	5.0	10	3.5	66	4.3
Full time farming for ≥ 10 yrs	115	39.7	113	33.2	132	42.2	109	36.3	110	38.5	579	37.9

The majority of the males (85%) were engaged in farming (part-time or full-time) while 70% were engaged for more than 10 years. Paddy (82%) was the main crop for farming, while chena (64%) and vegetable (25%) farming were followed. Majority of the males were engaged in full-time farming (38%) for more than 10 years followed by part-time farming (31%) for more than 10 years.

Table 3.5: Distribution of the Female Study Population by the Duration of Engagement in Different Types of Farming and Study Areas

Variable	Area 1		Area 2		Area 3		Area 4		Area 5		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Duration of any type of farming (n=3274)												
No farming	129	20.9	253	37.9	194	31.6	203	29.0	190	28.1	969	29.6
< 10 yrs	124	20.1	81	12.1	95	15.5	144	20.6	98	14.5	542	16.6
≥ 10 yrs	365	59.1	334	50.0	324	52.9	353	50.4	387	57.3	1763	53.8
Duration of paddy farming (n=3274)												
No paddy farming or no farming	229	37.1	322	48.2	246	40.1	298	42.6	256	37.9	1351	41.3
< 10 yrs	86	13.9	61	9.1	63	10.3	89	12.7	67	9.9	366	11.2
≥ 10 yrs	303	49.0	285	42.7	304	49.6	313	44.7	352	52.1	1557	47.6

Duration of vegetable farming (n=3274)												
No vegetable farming or no farming	533	86.2	563	84.3	482	78.6	507	72.4	493	73.0	2578	78.7
< 10 yrs	26	4.2	12	1.8	33	5.4	52	7.4	42	6.2	165	5.0
≥ 10 yrs	59	9.5	93	13.9	98	16.0	141	20.1	140	20.7	531	16.2
Duration of chena cultivation (n=3274)												
No Chena farming no farming	178	28.8	395	59.1	296	48.3	347	49.6	284	42.1	1500	45.8
< 10 yrs	113	18.3	43	6.4	56	9.1	72	10.3	52	7.7	336	10.3
≥ 10 yrs	327	52.9	230	34.4	261	42.6	281	40.1	339	50.2	1438	43.9
Ever occupied in any farming and duration (n=3274)												
No	131	21.2	257	38.5	199	32.5	211	30.1	192	28.4	990	30.2
Part time farming for < 10 yrs	53	8.6	42	6.3	30	4.9	33	4.7	34	5.0	192	5.9
Part time farming for ≥ 10 yrs	121	19.6	106	15.9	103	16.8	107	15.3	86	12.7	523	16.0
Full time farming for < 10 yrs	74	12.0	44	6.6	60	9.8	103	14.7	62	9.2	343	10.5
Full time farming for ≥ 10 yrs	239	38.7	219	32.8	221	36.1	246	35.1	301	44.6	1226	37.4

The majority of the females (70%) were engaged in farming while 54% were engaged for more than 10 years. Paddy (59%) was the main crop for farming, while chena (54%) and vegetable (22%) farming also occurred. Approximately one-third of the females were engaged in full-time farming (37%).

Comparison of involvement of any type of farming along with the duration of farming among males and females showed that a higher proportion of males reported part-time farming compared to females, irrespective of the duration. When considering full time farming for <10 years, the proportion of females was higher compared to males while the proportions of males and females who reported engagement in full-time farming for 10 or more years were similar.

Comparing the proportions of males and females based on their engagement of different types of farming along with the duration showed that paddy farming, approximately two-

thirds of males (66.6%) and approximately half of females (47.6%) were engaged in farming for 10 or more years. Approximately one-fifth of males (20.1) and females (16.1%) were engaged in vegetable farming for 10 or more years. More than half of males (54.5%) and nearly half of females (43.9%) were engaged in chena farming for 10 or more years

Study population by the presence of selected non-communicable diseases (NCD) is shown in Table 3.6.

Table 3.6: Distribution of the Study Population by the Presence of Selected Non-Communicable Diseases reported by the Respondent as being diagnosed (with or without confirmation through medical records) and Study Areas

Presence of NCDs (n=4803)	Area 1		Area 2		Area 3		Area 4		Area 5		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Hypertension	133	14.6	153	15.2	153	16.5	160	16.0	134	13.9	733	15.3
Diabetes Mellitus	77	8.5	105	10.4	67	7.2	68	6.8	49	5.1	366	7.6
Ischemic Heart Diseases	29	3.2	35	3.5	29	3.1	37	3.7	34	3.5	164	3.4

Hypertension was the most common NCD among the study population (15.3%) while the proportion who reported as having diabetes mellitus was 7.6%. The National Survey of self-reported health in Sri Lanka 2014 by the Department of Census and Statistics reported hypertension to be 9.2%, diabetes mellitus to be 7.2% and heart diseases 2.1% indicating that the corresponding proportions in the present study were higher, particularly for hypertension.

Table 3.7 shows the record confirmed the current use of Angiotensin-converting enzyme inhibitors.

Table 3.7: Distribution of the Study Population by the Current Use of Angiotensin-Converting Enzyme Inhibitors Verified by the Medical Reports and Study Areas

Current use of Angiotensin-converting enzyme inhibitors verified by the medical reports (n=4803)	Area 1		Area 2		Area 3		Area 4		Area 5		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Yes	23	2.5	13	1.3	24	2.6	35	3.5	15	1.6	110	2.3
No	885	97.5	995	98.7	290	97.4	965	96.5	946	98.4	4693	97.7

Only a minority (2.3%) were verified as using Angiotensin-converting enzyme inhibitors.

The study participants were asked about the history of CKD among parents and siblings (Table 3.8).

Table 3.8: Distribution of the Study Population by the History of CKD among Parents and Siblings and Study Areas

History of CKD among parents or siblings (n=4803)	Area 1		Area 2		Area 3		Area 4		Area 5		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Yes	150	16.5	288	28.6	396	42.8	375	37.6	373	38.9	1582	33.0
No	758	83.5	719	71.4	530	57.2	623	62.4	587	61.1	3217	67.0

One third (33%) of the study population reported that either their parents or siblings had been diagnosed as having CKD.

Table 3.9 shows the distribution of the study population by the habits of use of tobacco, alcohol and smokeless tobacco.

Table 3.9: Distribution of the Study Population by Use of Tobacco, Alcohol and Smokeless Tobacco, Sex and Study Areas

Tobacco, Alcohol and Smokeless Tobacco use	Area 1		Area 2		Area 3		Area 4		Area 5		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Tobacco use(n=4803)												
Ever use (n=814)												
Male	140	48.3	161	47.4	179	57.2	167	55.7	147	51.4	794	51.9
Female	06	1.0	05	0.7	01	0.2	04	0.6	04	0.6	20	0.6
Current use (n=416)												
Male	88	30.3	78	22.9	100	31.9	83	27.7	56	19.6	405	26.5
Female	02	0.3	03	0.4	01	0.2	02	0.3	03	0.4	11	0.3
Alcohol use (n=4803)												
Ever use (n=1177)												
Male	224	77.2	230	67.6	232	74.1	226	75.3	210	73.4	1122	73.4
Female	32	5.2	09	1.3	04	0.7	06	0.9	06	0.9	57	1.7

Current use (n=831)												
Male	155	53.4	161	47.4	170	54.3	168	56.0	152	53.1	806	52.7
Female	12	1.9	03	0.4	03	0.5	03	0.4	04	0.6	25	0.8
Smokeless tobacco use (n=4803)												
Ever use (n=957)												
Male	160	55.2	153	45.0	100	31.9	117	39.0	104	36.4	634	41.5
Female	157	25.4	70	10.5	28	4.6	36	5.1	32	4.7	323	9.9
Current use (n=793)												
Male	129	44.5	132	38.8	86	27.5	105	35.0	96	33.6	548	35.8
Female	97	15.7	61	9.1	26	4.2	33	4.7	28	4.1	245	7.5

Ever use as well as current use of tobacco, alcohol and smokeless tobacco among males were shown to be high (tobacco ever use-51.9%, current use- 26.5%; alcohol ever use-73.4%, current use- 52.7%; smokeless tobacco ever use-41.5%, current use- 35.8%). Among females, only a few used alcohol and tobacco while small proportions recorded smokeless tobacco use (ever use-41.5%, current use- 35.8%) which was much less than the corresponding proportions among male.

The Steps survey for NCDs 2015 by the Ministry of Health reported a proportion of current smokers of 29.5% among males and 0.1% among females. Current use of alcohol among males and females were 34.8% and 0.5%, respectively while the current use of smokeless tobacco among males and females were 26% and 5.3%, respectively.

Table 3.10 shows the study population by the most frequently used drinking water sources for at least 10 years as reported by the respondents.

Table 3.10: Distribution of the Study Population by Drinking Water Sources (within the top three most frequently used sources for at least 10 years as reported by the respondents) and Study Areas

Variable	Area 1		Area 2		Area 3		Area 4		Area 5		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Deep Well (n=4803)												
Yes	493	54.3	833	82.6	733	79.2	850	85.0	741	77.1	3650	76.0
No	415	45.7	175	17.4	193	20.8	150	15.0	220	22.9	1153	24.0
Shallow wells (n=4803)												
Yes	80	8.8	72	7.1	82	8.9	84	8.4	79	8.2	397	8.3
No	828	91.2	936	92.9	844	91.1	916	91.6	882	91.8	4406	91.7
Tube well (n=4803)												
Yes	141	15.5	39	3.9	93	10.0	53	5.3	170	17.7	496	10.3
No	767	84.5	969	96.1	833	90.0	947	94.7	791	82.3	4307	89.7
Tanks (n=4803)												
Yes	4	0.4	4	0.4	5	0.5	2	0.2	1	0.1	16	0.3
No	904	99.6	1004	99.6	921	99.5	998	99.8	960	99.9	4787	99.7
Community water supply projects (n=4803)												
Yes	5	0.6	9	0.9	45	4.9	9	0.9	4	0.4	72	1.5
No	903	99.4	999	99.1	881	95.1	991	99.1	957	99.6	4731	98.5
Agriculture water (n=4803)												
Yes	01	0.1	0	0.0	0	0.0	0	0.0	0	0.0	1	0.1
No	907	99.9	1008	100.0	926	100.0	1000	100.0	961	100.0	4802	99.9
Water canals (n=4803)												
Yes	0	0.0	0	0.0	0	0.0	0	0.0	1	0.1	1	0.1
No	908	100.0	1008	100.0	926	100.0	1000	100.0	960	99.9	4802	99.9
RO water (n=4803)												
Yes	7	0.8	6	0.6	8	0.9	5	0.5	11	1.1	37	0.8
No	901	99.2	1002	99.4	918	99.1	995	99.5	950	98.9	4766	99.2

Deep well was ranked within the top three most frequently used sources for at least 10 years by more than three fourths (76%) of the study population. The usage of RO water remains low as 0.8% among the study participants.

Self-reported 'non-rare' use of chemical fertilizers/weedicides/ pesticides for at least 5 years as reported by the study population is shown in Table 3.11.

Table 3.11: Distribution of the Study Population by Exposure to Chemical Fertilizers/Weedicides/ Pesticides (self-reported 'non-rare' use for at least 5 years) and Study Areas

Variable	Area 1		Area 2		Area 3		Area 4		Area 5		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Chemical fertilizers (n=4803)												
Yes	71	7.8	81	8.0	77	8.3	106	10.6	65	6.8	400	8.3
No	837	92.2	927	92.0	849	91.7	894	89.4	896	93.2	4403	91.7
Weedicides (n=4803)												
Yes	33	3.6	57	5.7	57	6.2	65	6.5	46	4.8	258	5.4
No	875	96.4	951	94.3	869	93.8	935	93.5	915	95.2	4545	94.6
Pesticides (n=4803)												
Yes	33	3.6	59	5.9	63	6.8	64	6.4	44	4.6	263	5.5
No	875	96.4	949	94.1	863	93.2	936	93.6	917	95.4	4540	94.5
Exposed to any chemicals (n=4803)												
Yes (404)	71	8.2	81	8.3	77	8.7	109	11.4	67	7.2	404	8.8
No (4200)	799	91.8	888	91.7	805	91.3	844	88.6	864	92.8	4200	91.2

Only a minority reported 'non-rare' use of chemical fertilizers (8.3%), weedicides (5.4%) and pesticides (5.5%) for at least 5 years. However, exposure to any chemical remained high at 43% and it fell to 34% when considering use for more than 5 years.

In an attempt to assess the pattern of hydration and exposure to sunlight among the study population, amount of drinking water consumed per a usual day (Table 3.12) and the duration of work done outdoors in the sunlight (Table 3.13) were asked about.

Table 3.12: Distribution of the Study Population by Amount of Drinking Water Consumed per a usual day as Reported by the Respondents and Study Areas

Amount of water per day (Liters) (n=4803)	Area 1		Area 2		Area 3		Area 4		Area 5		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Less than 3 liters	565	62.2	566	56.2	478	51.6	585	58.5	543	56.5	2737	57.0
3 or more liters	343	37.8	442	43.8	448	48.4	415	41.5	418	43.5	2066	43.0

More than half (57%) reported drinking less than 3 litres per a usual day.

Table 3.13: Distribution of the Study Population by Duration of Work done Outdoors in the Sunlight (self-reported hours of outdoor work per usual day and days per usual week in the sunlight) and Study Areas

Work outside the sun per week (n=4803)	Area 1		Area 2		Area 3		Area 4		Area 5		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Less than 20 hrs per week	498	54.8	672	66.7	665	71.8	690	69.0	694	72.2	3219	67.0
20 hrs or more per week	410	45.2	336	33.3	261	28.2	310	31.0	267	27.8	1584	33.0

One third (33%) reported working 20 hrs or more per week outdoors in the sunlight.

The study participants were asked about the history of being admitted to a western medical facility and kept under observation for complications for more than 24 hours or having received anti-venom treatment as an indication of envenomation following a snake bite (Table 3.14).

Table 3.14: Distribution of the Study Population by History of Envenomation Following a Snake Bite (history of being admitted to a western medical facility and kept under observation for complications for more than 24 hours or having received anti-venom treatment)

Variable	Area 1		Area 2		Area 3		Area 4		Area 5		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Cobra (n=4803)												
Yes	04	0.4	04	0.4	03	0.3	0	0.0	02	0.2	13	0.3
No	904	99.6	1004	99.6	923	99.7	1000	100.0	959	99.8	4790	99.7

Viper (n=4803)												
Yes	27	3.0	18	1.8	25	2.7	22	2.2	27	2.8	119	2.5
No	881	97.0	990	98.2	901	97.3	978	97.8	934	97.2	4684	97.5
Common krait (n=4803)												
Yes	0	0.0	01	0.1	0	0.0	01	0.1	02	0.2	04	0.1
No	908	100.0	1007	99.9	926	100.0	999	99.9	959	99.8	4799	99.9
Kuna katuwa (n=4803)												
Yes	29	3.2	14	1.4	22	2.4	32	3.2	27	2.8	124	2.6
No	879	96.8	994	98.6	904	97.6	968	96.8	934	97.2	4679	97.4
Scorpion (n=4803)												
Yes	02	0.2	04	0.4	05	0.5	04	0.4	02	0.2	17	0.4
No	906	99.8	1004	99.6	921	99.5	996	99.6	959	99.8	4786	99.6
Any snake (n=4803)												
Yes	57	6.3	37	3.7	47	5.1	53	5.3	55	5.7	249	5.2
No	851	93.7	971	96.3	879	94.9	947	94.7	906	94.3	4554	94.8

Only a minority (5.2%) gave a history of envenomation following a snake bite, with viper (2.5%) and kuna katuwa (2.6%) bites being the commonest while any snake bite gave the value of 5.2%.

The study populations by their biological parameters are shown in Table 3.15.

Table 3.15: Distribution of the Study Population by the Biological Parameters and Study Areas

Feature	Area 1		Area 2		Area 3		Area 4		Area 5		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Categories of Body Mass Index (n=4780)*												
Underweight												
Male	48	17.0	59	17.4	68	22.1	80	26.7	36	12.8	291	19.3
Female	94	15.3	74	11.1	92	15.0	93	13.3	75	11.1	428	13.1
Normal												

Male	172	60.8	173	51.0	162	52.8	162	54.0	178	63.1	847	56.1
Female	290	47.1	299	44.8	291	47.5	366	52.4	353	52.3	1599	48.9
Overweight												
Male	51	18.0	92	27.1	66	21.5	52	17.3	58	20.6	319	21.1
Female	184	29.9	219	32.8	181	29.6	186	26.6	184	27.3	954	29.2
Obese												
Male	12	4.2	15	4.4	11	3.6	6	2.0	10	3.5	54	3.6
Female	48	7.8	75	11.2	48	7.8	54	7.7	63	9.3	288	8.8
Categories of body fat % (n=4779)[#]												
1st tertile (< 25)												
Male	206	72.8	222	65.9	224	73.0	240	80.0	212	75.2	1104	73.2
Female	77	12.5	68	10.2	93	15.2	86	12.3	73	10.8	397	12.1
2nd tertile (25-34)												
Male	63	22.3	105	31.2	74	24.1	58	19.3	66	23.4	366	24.3
Female	254	41.2	244	36.6	237	38.7	311	44.5	291	43.1	1337	40.9
3rd tertile (>34)												
Male	14	4.9	10	3.0	9	2.9	2	0.7	4	1.4	39	2.6
Female	286	46.4	355	53.2	282	46.1	302	43.2	311	46.1	1536	47.0
Categories of body water % (n = 4733)[+]												
1st tertile (< 47)												
Male	13	4.6	10	3.0	11	3.6	1	0.3	5	1.8	40	2.7
Female	290	47.1	342	52.0	257	42.5	279	40.5	281	42.6	1450	44.9
2nd tertile (47-52)												
Male	62	21.9	108	32.1	78	25.6	59	19.7	68	24.1	375	24.9
Female	252	40.9	250	38.0	265	43.9	326	47.3	321	48.6	1414	43.8
3rd tertile (>52)												
Male	208	73.5	218	64.9	216	70.8	240	80.0	209	74.1	1091	72.4
Female	74	12.0	65	9.9	82	13.6	84	12.2	58	8.8	363	11.2

** BMI values were missing in 23 Subjects*

[#] Body fat % values were missing in 24 Subjects

[+] Body water % values were missing in 70 Subjects

The underweight (19.3%) and normal BMI categories (56.3%) were common among males compared to females, while the categories of overweight (29.2%) and obese (8.8%) were common among females compared to males (overweight 21.1% and 3.5%).

Only a minority of males were in the 3rd tertile (2.6%) while approximately half of the females were in the 3rd tertile (47%). On the other hand, only a minority of females were in the 3rd tertile (11.2%) while approximately two-thirds of the males were in the 3rd tertile (72.4%).

Distribution of the study population by the mean eGFR is shown in Table 3.16 and the distribution of the study population by the stages of CKD classification based on eGFR is shown in Tables 3.17 and 3.17b.

Table 3.16: Distribution of the Study Population by the Mean eGFR and Study Areas by Sex

Study Area	Male		Female		Total	
	Mean eGFR	95% CI	Mean eGFR	95% CI	Mean eGFR	95% CI
Area 1	87.1	83.7 - 90.5	91.6	89.7 – 93.5	90.2	88.5 – 91.9
Area 2	90.1	87.8 - 94.2	91.4	89.5 – 93.2	91.3	89.7 – 92.9
Area 3	82.0	78.3 - 85.6	91.3	89.2 – 93.3	88.2	86.3 – 90.0
Area 4	76.0	72.9 - 79.1	84.6	82.8 – 86.3	82.0	80.5 – 83.6
Area 5	81.1	77.7 - 84.5	89.3	87.5 – 91.1	86.9	85.3 – 88.5
Total	83.6	82.1- 85.1	89.6	88.7– 90.4	87.7	87.6 – 87.7

The lowest mean eGFR was reported in area 4 (82.0), which showed a statistically significant difference from all other areas combined. In all five areas, males showed a lower mean eGFR than females. Among males, although Area 4 showed the lowest mean eGFR, it was not statistically significant from other areas. Among females Area 4 showed the lowest mean eGFR which was statistically significant from other areas.

Table 3.17a: Distribution of the Study Population by the Stages of CKD Classification based on eGFR and Study Areas

eGFR categories	Area 1		Area 2		Area 3		Area 4		Area 5		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
> =90 (~Stage I)	462	19.9	551	23.8	482	20.8	369	15.9	454	19.6	2318	100.0
60-89.9 (~Stage II)	355	18.8	358	19.0	309	16.4	472	25.0	391	20.7	1885	100.0
30-59.9 (~Stage III)	64	15.3	70	16.7	85	20.3	116	27.8	83	19.9	418	100.0
15-29 .9(~Stage IV)	24	16.3	24	16.3	42	28.6	35	23.8	22	15.0	147	100.0

<15 (~Stage V)	3	8.6	51	14.3	8	22.9	8	22.9	11	31.4	35	100.0
Total	908	18.9	1008	21.0	926	19.3	1000	20.8	961	20.0	4803	100.0

Approximately half (48.4%) of the study population were classified into the Stage I of the CKD based on eGFR.

Table 3.18b: Distribution of the Study Population by the Stages of CKD Classification based on eGFR and Age Categories

eGFR categories	18-40		41-50		51-60		61-70		>70		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
> 90 (~Stage I)	1482	79.04	540	48.04	209	23.46	79	11.58	8	3.46	2318	48.26
60-89 (~Stage II)	378	20.16	522	46.44	530	59.48	358	52.49	97	41.99	1885	39.25
30-59 (~Stage III)	14	0.75	50	4.45	120	13.47	155	22.73	79	34.20	418	8.70
15-29 (~Stage IV)	1	0.05	10	0.89	24	2.69	75	11.00	37	16.02	147	3.06
<15 (~Stage V)	0	0.00	2	0.18	8	0.90	15	2.20	10	4.33	35	0.73
Total	1875	100	1124	100	891	100	682	100	231	100	4803	100

While two fifth (39%) of the respondents who are below the 40 years are in stage 1, only 3.5% of respondents who are above 70 years in stage 1.

On the other hand, among the respondents who are below 40 years of age less than 1% are in stage III while respondents who are above 70 years more than one-third (34%) are in stage III.

Results of investigations on different combinations of eGFR < 60 mL/min using CKD EPI equation: one-time measurement using standardized methods for creatinine measurement AND/OR albuminuria > = 30 mg/g which are the essential screening criteria for CKD/CKDu among the study population are shown in Table 3.18.

Table 3.19: Presence of Essential Screening Criteria for CKD/CKDu by Sex and Study Areas

Presence	Area 1		Area 2		Area 3		Area 4		Area 5		Total	
	%	CI	%	CI	%	CI	%	CI	%	CI	%	CI
Presence of essential screening criteria for CKD/CKDu (eGFR <60mL/min AND/OR albuminuria ≥30mg/g creatinine)* (n=868)												
Total	17.1	14.7-19.6	17.7	15.4-20.1	18.7	16.2-21.3	18.0	15.7-20.5	18.9	16.5-21.5	18.0	17.0 – 19.1

Male	22.8	18.2-27.9	22.4	18.2-27.0	26.8	22.2-32.0	26.3	21.6-31.6	28.7	23.7-34.1	22.8	18.2-27.9
Female	14.4	11.8-17.3	15.3	12.7 - 18.2	14.5	11.9-17.5	14.4	12.0-17.2	14.8	12.3-17.7	14.4	11.8-17.3
Presence of the essential screening criteria eGFR <60mL/min (with or without albuminuria ≥30mg/g creatinine)(n=600)												
Total	10.0	8.2-12.1	9.8	8.1-11.8	14.6	12.4-17.0	15.9	13.7-18.3	12.1	10.1 - 14.2	12.4	11.5 – 13.4
Male	16.2	12.3-20.9	12.9	9.7-16.9	23.0	18.6-28.0	24.3	19.8-29.5	19.9	15.6 - 24.9	19.1	17.2 – 21.2
Female	7.1	5.3-9.4	8.2	6.3-10.5	10.3	8.1-12.9	12.3	10.0 - 14.9	8.7	6.8 - 11.1	9.3	8.4 – 10.4
Presence of the essential screening criteria albuminuria ≥30mg/g creatinine (with or without eGFR <60mL/min) (n=450)												
Total	10.9	9.0 - 13.1	12.3	10.4 - 14.4	8.9	7.1 - 10.8	4.4	3.2 - 5.8	10.5	8.7 - 12.6	9.3	8.5 – 10.2
Male	14.5	10.8 - 19.0	15.9	12.3 - 20.1	14.1	10.62 - 18.3	5.7	3.5 - 8.9	15.7	11.9 - 20.4	13.2	11.6 – 15.0
Female	9.2	7.1 - 11.7	10.5	8.3 - 13.0	6.2	4.5 - 8.4	3.9	2.6-5.5	8.3	6.4 - 10.6	7.5	6.7 – 8.5
Presence of the essential screening criteria eGFR <60mL/min without albuminuria ≥30mg/g creatinine(n=418)												
Total	6.2	4.7 - 7.9	5.4	4.1 - 6.6	9.8	8.0 - 11.9	13.6	11.6 - 15.8	8.4	6.8 - 10.3	8.7	7.0 – 9.5
Male	8.3	5.6 - 12.0	6.5	4.2 - 9.6	12.8	9.5 - 16.9	20.7	16.4 - 25.6	12.9	9.5 - 17.3	12.1	10.5 – 13.8
Female	5.2	3.6 - 7.2	4.8	3.4 - 6.6	8.3	6.3 - 10.7	10.6	8.4 - 13.0	6.5	4.8 - 8.6	7.1	6.2 – 8.0
Presence of the essential screening criteria albuminuria ≥30mg/g creatinine without eGFR <60mL/min (n=268)												
Total	7.0	5.5 - 8.9	7.8	6.3 - 9.6	4.1	2.9 - 5.5	2.1	1.3 - 3.2	6.9	5.4 - 8.6	5.5	4.9 – 6.2
Male	6.6	4.2 - 10.0	9.4	6.7 - 13.0	3.8	2.1 - 6.6	2.0	0.8 - 4.3	8.7	5.9 - 12.6	6.1	5.0 – 7.4
Female	7.3	5.4 - 9.6	7.0	5.3 - 9.2	4.2	2.9 - 6.1	2.1	1.2 - 3.5	6.1	4.5 - 8.1	5.3	4.5 – 6.1

A total of 868 study participants were positive for the essential criteria for suspected CKDu. The proportion of males (22.8%, 95% CI 18.2%-27.9%) with the positive criteria were greatly higher than the females (14.4%, 95% CI 11.8%-17.3%). The difference was statistically significant.

The number of participants with the essential screening criteria on eGFR <60mL/min (with or without albuminuria ≥30mg/g) was 600 and the proportion of males (19.1%, 95% CI 17.2% – 21.2%) was more than double of the corresponding proportion among females (9.3%, 95% CI 8.4% – 10.4%).

The number with the essential screening criteria on albuminuria ≥30mg/g creatinine (with or without eGFR <60mL/min) was 450. The proportions among males (13.2%, 95% CI 11.6% – 15.0%) was significantly higher than the females (7.5%, 95% CI 6.7% – 8.5%).

Prevalence of Suspected CKDu among males and females are shown in Table 3.19a, 3.19b and 3.19c.

Table 3.20a: Prevalence of Categories of Suspected CKDu by Sex and Study Areas

Prevalence	Area 1		Area 2		Area 3		Area 4		Area 5		Total	
	%	CI	%	CI	%	CI	%	CI	%	CI	%	CI
Suspected CKDu[2] (n=545)												
Total	12.3	10.1 - 14.8	12.3	10.2 - 14.7	13.7	11.4 - 16.2	14.7	12.4 - 17.2	14.3	12.0 - 16.8	13.3	12.4 – 14.5
Males	14.9	10.8 - 20.0	16.2	12.3 - 21.0	20.8	16.3 - 26.1	25.0	20.0 - 30.6	22.8	17.9 - 28.5	19.9	17.8 – 22.2
Female	11.1	8.0 - 13.2	10.4	7.7- 12.9	10.1	8.0 - 13.0	10.3	8.5- 13.5	10.8	8.5 – 13.5	10.5	9.4 – 11.7

Prevalence of suspected CKDu among males was 19.9% (95% CI 17.8% – 22.2%) and was almost double the corresponding prevalence among females 10.5% (95% CI 9.4% – 11.7%).

[2] *Following are the criteria used to classify study participants as Suspected CKDu*

Essential criteria: eGFR < 60 mL/min using CKD EPI equation: One time measurement using standardized methods for creatinine measurement AND/OR albuminuria > = 30 mg/g

Exclusion criteria to identify suspect CKDu among those satisfying above criteria

i. Urine protein: creatinine ratio > 2 g/g creatinine OR urine albumin: creatinine ratio >0.3 g/g creatinine

ii. Hypertensive on treatment with more than two drugs OR untreated blood pressure of more than 160/100 mmHg (preferably using electronic BP apparatus, sitting position, at least two readings one minute apart)

iii. History of diabetes OR being on treatment OR capillary random plasma glucose >200 mg/dL

Table 3. Error! Bookmark not defined.**b: Prevalence of Categories of Suspected CKDu among Males by Age Categories and Study Areas**

Prevalence	Area 1		Area 2		Area 3		Area 4		Area 5		Total	
	%	CI	%	CI	%	CI	%	CI	%	CI	%	CI
Suspected CKDu (n=254)												
18-30 years	3.4	0.4 - 21.3	4.2	1.0 - 15.3	2.4	0.3 - 15.7	0.0	0 - 0	3.2	0.4 - 20.1	2.8	1.1 - 6.5
31-40 years	3.6	0.8- 13.5	3.2	0.7 - 11.9	4.3	1.07 - 16.0	0.0	0 - 0	15.0	7.9 - 26.5	5.6	3.3- 9.0
41-50 years	19.5	9.9- 34.6	16.7	10.0 - 26.2	16.3	9.8- 25.7	14.5	7.9 - 24.9	7.0	2.6 - 17.3	14.8	11.49 - 19.0
51-60 years	18.4	9.7 - 31.8	33.3	20.7 - 48.9	26.1	15.3 - 40.7	33.3	21.7 - 47.3	27.1	16.3 - 41.4	27.5	22.2 - 33.6
61-70 years	17.0	8.6 - 30.6	37.0	20.9 - 56.6	50.0	33.0 - 66.9	57.8	42.9 - 71.3	60.6	43.0 - 75.7	43.5	36.4 - 50.8
> 70	50.0	25.2 - 74.7	23.1	7.2 - 53.4	76.9	46.5 - 92.7	68.8	42.4 - 86.7	66.7	36.3 - 87.5	57.4	45.3 - 68.5
All	14.9	10.8 - 20.0	16.2	12.3 - 21.0	20.8	16.3 - 26.1	25.0	20.0 - 30.6	22.8	17.9 - 28.5	19.9	17.8 – 22.2

Prevalence of suspected CKDu among males was seen to increase with the advancement of the age. Highest recorded in the age category of more than or equal to 70 group.

Table 3. Error! Bookmark not defined.**c: Prevalence of Categories of Suspected CKDu among Females by Age Categories and Study Areas**

Prevalence	Area 1		Area 2		Area 3		Area 4		Area 5		Total	
	%	CI	%	CI	%	CI	%	CI	%	CI	%	CI
Suspected CKDu (n=291)												
18-30 years	1.8	0.4 - 7.0	5.2	2.3- 11.0	4.9	2.2- 10.5	2.3	0.7- 6.9	2.9	0.9 - 8.6	3.5	2.2 - 5.2
31-40 years	7.0	3.8 - 12.6	6.7	3.4 - 12.3	2.9	1.0 - 7.4	3.8	1.6- 8.1	4.0	1.9 - 8.2	4.8	3.4 - 6.5
41-50 years	9.6	5.0- 17.4	7.8	4.3- 13.5	6.5	3.2 - 12.5	6.0	3.0- 11.5	11.1	6.7- 17.6	8.1	6.2 - 10.5
51-60 years	14.3	8.4 - 23.1	15.1	9.0 - 23.85	13.9	7.6 - 24.0	11.8	6.6 - 20.1	16.0	10.0 - 24.5	14.3	11.3 - 17.8
61-70 years	24.1	14.4 - 37.3	18.5	10.2 - 31.2	30.6	19.2 - 44.9	39.7	27.8- 52.7	24.6	15.3 - 36.9	27.5	22.5 - 33.1
> 70	41.7	23.7 - 62.0	63.6	32.5 - 86.3	45.5	26.0 - 66.3	50.0	28.9 - 71.0	58.3	29.6 - 82.2	49.4	39.1 - 59.7

All	11.1	8.0 - 13.2	10.4	7.7- 12.9	10.1	8.0 - 13.0	10.3	8.5- 13.5	10.8	8.5 – 13.5	10.5	9.4 – 11.7

In keeping with the pattern among males, the prevalence of suspected CKDu among females also increased with the advancement of the age. Highest recorded in the age category of more than or equal to 70 group. However, it is noted that females of all age categories except 18-30years recorded a lower prevalence compared to their male counterparts.

Table 3.19d shows the prevalence of presence of Essential screening criteria and a known cause for CKD by Sex and Study Areas.

Table 3. Error! Bookmark not defined.**d: Prevalence of Presence of Essential Screening Criteria and a Known Cause for CKD by Sex and Study Areas**

Prevalence	Area 1		Area 2		Area 3		Area 4		Area 5		Total	
	%	CI	%	CI	%	CI	%	CI	%	CI	%	CI
Presence of essential screening criteria and a known cause for CKD (n=323)												
Total	6.9	5.4 - 8.7	7.5	6.0 - 9.3	7.0	5.5 - 8.8	5.5	4.2 - 7.0	6.7	5.2 - 8.4	6.7	6.0 – 7.4
Male	10.7	7.6 - 14.8	9.1	6.4 - 12.6	9.3	6.5 - 13.0	5.0	3.0 - 8.1	9.4	6.5 - 13.4	8.6	7.3 – 10.2
Female	5.2	3.6 - 7.2	6.7	5.0 - 8.9	5.9	4.2 - 8.0	5.7	4.2 - 7.6	5.5	3.9 - 7.4	5.8	5.0 – 6.6

The presence of essential screening criteria and a known cause for CKD as identified by the present survey was significantly higher among males (8.6% (95%CI 7.3 %- 10.2%)) than the females (5.8% (95% CI 5.0% - 6.6%)). This was considered as a proxy measure for CKD (of known cause) in the present study in the absence of the confirmation of the essential criteria in 12 weeks.

The details of the distribution of the study population by presence of each of the exclusion criteria to identify Suspected CKDu (Urine albumin: creatinine ratio >0.3 g/g creatinine, hypertensive on treatment with more than two drugs or untreated blood pressure of more than 160/100 mmHg, history of diabetes or being on treatment or capillary random plasma glucose >200 mg/dL measured Blood Pressure (using electronic BP apparatus, sitting

position, average of three readings one minute apart), measured capillary random blood sugar levels) are shown in Tables 3.19e-3.19g in the Annexure IV. Prevalence of suspected CKDu by varying the exclusion criteria of hypertension and diabetes are shown in Table 3.19h.

Table 3. Error! Bookmark not defined.**h: Prevalence of Suspected CKDu by Varying the Exclusion Criteria of Hypertension and Diabetes by Sex and Study Areas**

Prevalence	Area 1		Area 2		Area 3		Area 4		Area 5		Total	
	%	CI	%	CI	%	CI	%	CI	%	CI	%	CI
Suspected CKDu' (Exclusion criteria ONLY hypertension -as in the existing case definition) **(n=653)** **Inclusion criteria** eGFR<60 AND/OR Albuminuria >30mg/g **Exclusion criteria** i. Urine protein: creatinine ratio > 2 g/g creatinine OR urine albumin: creatinine ratio >0.3 g/g creatinine ii. Hypertensive on treatment with more than two drugs OR untreated blood pressure of more than 160/100 mmHg												
Total	13.6	11.4 - 16.1	14.4	12.2 - 16.7	15.1	12.8 - 17.6	15.4	13.2 - 17.8	15.0	12.8 - 17.5	14.7	13.7 – 15.7
Male	16.4	12.3 - 21.4	17.6	13.7- 22.2	21.9	17.4 - 27.0	25.1	20.3 - 30.5	23.7	18.9- 29.3	20.8	18.8 – 23.1
Female	12.4	9.9- 15.3	12.8	10.3 - 15.6	11.7	9.3 - 14.5	11.2	8.9 - 13.9	11.4	9.1 - 14.1	11.8	10.7 – 13.1
Suspected CKDu' (Exclusion criteria ONLY hypertension -using 'Possible Hypertension') **(n=358)** **Inclusion criteria** eGFR<60 AND/OR Albuminuria >30mg/g **Exclusion criteria** i. Urine protein: creatinine ratio > 2 g/g creatinine OR urine albumin: creatinine ratio >0.3 g/g creatinine ii. **'Possible Hypertension'** • BP more than 140/90 at the time of the survey • being on anti-hypertension drugs (any number) • Self-reported as having hypertension with evidence of medical records												
Total	9.8	7.7- 12.2	11.2	9.1 - 13.7	8.6	6.7- 10.9	10.2	8.1- 12.6	11.2	9.0 - 13.7	10.2	9.2 – 11.2
Male	9.5	6.1 - 14.4	11.2	7.8- 15.6	14.8	10.7 - 20.0	18.3	13.4 - 24.3	18.8	13.9- 24.6	14.3	12.4 – 16.5
Female	9.9	7.4- 12.9	11.2	8.7 - 14.3	5.4	3.6 - 7.9	7.0	5.0- 9.6	8.1	6.0 - 10.8	8.3	7.3 – 9.5
Suspected CKDu' (Exclusion criteria hypertension criteria modified to 'Possible hypertension') **(n=318)** **Inclusion criteria** eGFR<60 AND/OR Albuminuria >30mg/g **Exclusion criteria** i. Urine protein: creatinine ratio > 2 g/g creatinine OR urine albumin: creatinine ratio >0.3 g/g creatinine												

ii. **'Possible Hypertension'** • BP more than 140/90 at the time of the survey • being on anti-hypertension drugs (any number) • Self-reported as having hypertension with evidence of medical records Iii History of diabetes OR being on treatment OR capillary random plasma glucose >200 mg/dL												
Total	8.8	6. - 11.2	9.8	7.7 - 12.2	8.4	6.4 - 10.8	9.9	7.8 - 12.3	11.0	8.8 - 13.5	9.5	8.6 – 10.6
Male	8.5	5.2 - 13.3	11.5	7.9 - 16.2	14.5	10.3 - 19.8	18.7	13.7- 24.9	18.7	13.8 - 24.7	14.2	12.2 – 16.5
Female	8.9	6.6 - 12.0	8.9	6.5 - 11.8	5.4	3.5 - 7.9	6.4	4.5 - 9.0	7.9	5.8- 10.6	7.5	6.4 – 8.6

Excluding only Hypertension (as defined in the existing case definition) increased the prevalence of Suspected CKDU by 1-2% among both males (20.8%, 95%CI 18.8%- 23.1%) and females (11.8%, 95% CI 10.7%-13.1%).

Excluding only hypertension but including 'possible hypertension' in this exclusion, lowered the prevalence of Suspected CKDu by 5.6% among males (14.3%, 95% CI 12.4% – 16.5%) and 2.2% among females (8.3%, 95% CI 7.3%- 9.5%).

Excluding hypertension including possible hypertension and also the diabetes mellitus criteria lowered the prevalence of Suspected CKDU by 5.7% among males (14.2%, 95% CI 12.2%-16.5%) and 3.0% among females (7.5%, 95%CI 6.4%-8.6%).

The prevalence of CKDu according to the definition used in the DEGREE protocol (Tables 3.19e-3.19g) is shown in Annexure V.

The analyses that follow excludes the study participants with a known cause for CKD (n=323) as identified by the present survey.

Tables 3.20 shows the socio-demographic characteristics of the study population by mean eGFR and Suspected CKDu.

Table 3.21: Basic Characteristics of the Study Population by Mean eGFR and Suspected CKDu

Feature	eGFR		Suspected CKDu			
			Yes		No	
	Mean	SD	n=545	%	n=3935	%
Age categories (Years) (n=4480)						
18 – 30 (n=772)	113.5	18.8	25	3.2	747	96.7
31 – 50 (n=2160)	94.3	18.7	152	7.0	2,008	92.9
51 – 70 (n=1367)	74.9	21.3	285	20.9	1,082	79.1
> 70 (n=181)	57.1	21.2	83	45.9	98	54.1
Sex (n=4480)						
Male (n=1396)	87.1	28.0	254	18.2	1142	81.8
Female (n=3084)	91.6	22.7	291	9.4	2,793	90.5
Marital status (n=4480)						
Currently Married (n=3743)	90.1	23.5	442	11.8	3,301	88.1
Other (n=737)	90.6	29.5	103	14.0	634	86.0
Ethnicity (n=4480)						
Sinhala (n=4450)	90.1	24.5	543	12.2	3907	87.8
Other (n=30)	99.5	31.8	2	6.7	28	93.3
Number of years of education in schools and in higher education institutes (n=4480)						
< 10 (n=1682)	78.8	24.7	336	20.0	1346	80.0
≥ 10 (n=2798)	97.1	21.8	209	7.5	2589	92.5
Average family monthly income (n=4480)						
Rs.30,000 or Less (n=2590)	85.9	25.7	384	14.8	2206	85.1
More than Rs.30,000 (n=1890)	96.1	21.5	161	8.5	1729	91.5
Ever occupied in farming (n=4480)						
Full time farming (n=2095)	85.1	22.7	284	13.6	1811	86.4
Part time farming (n=1229)	85.9	24.4	203	16.5	1026	83.5
No (n=1156)	104.1	22.6	58	5.0	1,098	94.9
Study area (n=4480)						
Area 1 (n=845)	92.9	23.7	92	10.9	753	89.1
Area 2 (n=932)	93.7	24.6	102	10.9	830	89.1

Area 3 (n=861)	91.4	26.2	108	12.5	753	87.4
Area 4 (n=945)	84.2	23.4	125	13.2	820	86.7
Area 5 (n=897)	89.2	23.8	118	13.15	779	86.8
Presence of selected Non-Communicable Diseases as reported by the respondent (with or without confirmation through medical records) (n=4480)						
Hypertension						
Present (n=559)	73.3	25.4	148	26.5	411	73.5
Absent (n=3921)	92.6	23.5	397	10.1	3524	89.9
Diabetes Mellitus						
Present (n=240)	86.5	16.9	0	0.0	240	100.0
Absent (n=4240)	90.4	24.9	545	12.9	3695	87.2
Ischemic Heart Disease						
Present (n=139)	77.7	26.6	29	21.0	110	79.0
Absent (n=4341)	90.6	24.4	516	11.9	3825	88.1

The proportions of suspected CKDU was higher >70 year age category, males, currently not married, Sinhalese, those with less than 10 years of education in schools and in higher education institutes, those in the average family monthly income of less than Rs. 30,000, those ever occupied in part-time farming, those living in study area 4 and those reported a history of ischemic heart disease.

Tobacco, alcohol and smokeless tobacco use habits of the study population by mean eGFR and Suspected CKDu is shown in Table 3.21.

Table 3.22: Tobacco, Alcohol and Smokeless Tobacco use Habits of the Study Population and by Mean eGFR and Suspected CKDu

Feature	eGFR		Suspected CKDu			
			Yes		No	
	Mean	SD	n	%	n	%
Ever use of tobacco use (n=4604)						
Yes (n=727)	80.0	27.1	171	23.5	556	76.5
No (n=3753)	92.2	23.5	374	10.0	3379	90.0
Male (n=1396)						
Yes (n=709)	80.4	27.1	165	23.3	544	76.7
No (n=687)	94.0	27.1	89	13.0	598	87.1
Female (n=3084)						
Yes (n=18)	64.2	22.3	6	33.3	12	66.7
No (n=3066)	91.7	22.6	285	9.3	2781	90.7
Ever use of alcohol (n=4604)						
Yes (n=1070)	83.7	26.3	211	19.7	859	80.3
No (n=3410)	92.2	23.6	334	9.8	3076	90.2
Male (n=3084)						
Yes (n=1019)	83.8	26.1	202	19.8	817	80.2
No (n=377)	96.1	30.7	52	13.8	325	86.2
Female (n=3084)						
Yes (n=51)	83.1	29.8	9	17.7	42	82.4
No (n=3033)	91.7	22.6	282	9.3	2751	90.7
Ever use of smokeless tobacco (n=4604)						
Yes (n=874)	83.7	28.1	173	19.8	701	80.2
No (n=3606)	91.8	23.4	372	10.3	3234	89.7
Male (n=1396)						
Yes (n=576)	82.6	29.4	132	22.9	444	77.1
No (n=820)	90.3	26.4	122	14.9	698	85.1
Female (n=3084)						
Yes (n=298)	85.9	25.1	41	13.8	257	86.2
No (n=2786)	92.2	22.4	250	9.0	2536	91.0

Among both sexes, higher proportions of those who reported ever use of tobacco, ever use of alcohol and ever use of smokeless tobacco were classified as suspected CKDu.

Table 3.22 shows the biological parameters of the study population by mean eGFR and Suspected CKDu.

Table 3.23: Biological Parameters of the Study Population by Mean eGFR and Suspected CKDu

Feature	eGFR		Suspected CKDu			
			Yes		No	
	Mean	SD	N	%	n	%
Categories of Body Mass Index (n=4081)*						
Under weight (n=298)	85.9	25.1	108	15.9	570	84.1
Normal (n=2284)	89.3	24.7	284	12.4	2000	87.6
Over weight (n=1186)	91.2	21.1	118	10.0	1,068	90.1
Obese (n=313)	92.3	21.4	108	15.9	570	84.1
Categories of body fat % (n=4460)#						
1st tertile (< 25) (n=1396)	87.5	28.2	241	17.3	1155	82.7
2nd tertile (25-34) (n=1596)	92.0	23.7	160	10.0	1436	90.0
3rd tertile (>34) (n=1468)	90.9	21.2	138	9.4	1330	90.6
Categories of body water % (n =4417)+						
1st tertile (< 47) (n=1411)	93.0	21.7	121	8.6	1290	91.4
2nd tertile (47-52) (n=1678)	92.1	23.3	167	10.0	1511	90.1
3rd tertile (>52) (n=1328)	84.9	27.9	250	18.8	1078	81.2

** BMI values were missing in 19 Subjects*

 # Body fat % values were missing in 20 Subjects

+ Body water % values were missing in 63 Subjects

Higher and equal proportions of the study populations were underweight as well as obese in the category of BMI, in the body fat % category of 1st tertile and in the body water category of 3rd tertile were classified as suspected CKDu.

Table 3.24: Study Population by History of CKD among Parents and Siblings and Mean eGFR and Suspected CKDu

Parents or siblings diagnosed with CKD /CKDu (n=4480)	eGFR		Suspected CKDu			
			Yes		No	
	Mean	SD	n	%	n	%
Yes (n=1476)	86.7	23.5	198	13.5	1274	86.6
No (n=3004)	91.9	24.9	347	11.6	2657	88.5

The proportions of study populations with parents or siblings being diagnosed with CKD /CKDu were classified as suspected CKDu were higher compared those who without.

The association between socio-demographic characteristics and eGFR and Suspected CKDu are shown in Table 3.24.

Table 3.25: Association between Socio-Demographic Characteristics and eGFR and Suspected CKDu

Variable	eGFR	Suspected CKDu
	Coefficient (95% CI)	OR (95% CI)
Age categories (Years) (n=4480)		
18 – 40 (n=)	1	1
41 – 50 (n=)	-16.1 (-17.6 - -14.6) #	2.2 (1.6 - 3.0) #
51 – 60 (n=)	-26.2 (-27.8 - -24.5) #	4.2 (3.1 - 5.6) #
61 – 70 (n=)	-36.3 (-38.2 - -34.4) #	8.5 (6.3 - 11.4) #
> 70 (n=)	-48.1 (-51.1 - -45.1) #	18.3 (12.6 - 26.7) #
Sex (n=4480)		
Male (n=1396)	-0.9 (-2.1 – 0.2) *	1.8 (1.5 - 2.2) *
Female (n=3084)	1	1
Marital status (n=4480)		
Currently Married (n=3743)	-2.1 (-3.6 - -0.6) $	0.9 (0.7 - 1.2) $
Other (n=737)	1	1
Ethnicity (n=4480)		
Sinhala (n=4450)	-11.6 (-18.5 - -4.4) $	4.3 (0.9 – 21.9) $
Other (n=30)	1	1

Number of years of education in schools and in higher education institutes (n=4480)	0.1 (0.02 - 0.2) $	0.7 (0.6 - 0.9) $
Average family monthly income (n=4480)		
Rs.30,000 or Less (n=2590)	1.2 (0.1 - 2.4) $	0.8 (0.7 - 1.0) $
More than Rs.30,000 (n=1890)	1	1
Study area (n=4480)		
Area 1 (n=845)	1	1
Area 2 (n=932)	-1.4 (-3.1 - 0.3) $	1.2 (0.8 - 1.672418) $
Area 3 (n=861)	-3.3 (-5.0 - -1.574252) $	1.3 (1.01 - 1.8) $
Area 4 (n=945)	-9.7 (-11.4 - -8.0) $	1.4 (1.04 - 1.9) $
Area 5 (n=897)	-5.2 (-6.9 - -3.5) $	1.5 (1.1 - 2.0) $

 # Sex adjusted ** Age adjusted* *$ Age & Sex adjusted*

Being in the age categories of 41 – 50 years, 51 – 60 years, 61 – 70 years and > 70 years when adjusted for sex, being a male when adjusted for age and living in Areas 3, 4 or 5 when adjusted for age and sex, were shown to be significant risk factors for Suspected CKDu and also significant predictors for decreasing eGFR.

Tables 3.25 and 3.26 show the age and sex-adjusted associations of characteristics or exposures and eGFR and Suspected CKDu.

Table 3.26: Age and Sex-Adjusted Association between Presence of Ischemic Heart Disease and eGFR and Suspected CKD

Presence of Ischemic Heart Disease as reported by the respondent as being diagnosed (with or without confirmation through medical records) (n=4480)	**eGFR**	**Suspected CKDu**
	Age & Sex adjusted Coefficient (95% CI)	**Age & Sex adjusted OR (95% CI)**
Present (n=139)	2.46 (-0.7 - 5.6)	0.8 (0.5 - 1.3)
Absent (n=4341)	1	1

Table 3.27: Age and Sex-Adjusted Association between Tobacco, Alcohol and Smokeless Tobacco use Habits and eGFR and Suspected CKDu

Variable	eGFR	Suspected CKDu
	Age & Sex adjusted Coefficient (95% CI)	Age & Sex adjusted OR (95% CI)
Tobacco use		
Ever use		
Yes (n=727)	-7.5 (-9.5 - -5.6)	1.7 (1.2 - 2.2)
No (n=3753)	1	1
Alcohol use		
Ever use		
Yes (n=1070)	-6.9 (-9.0 - -4.9)	1.4 (1.01 - 1.9)
No (n=3410)	1	1
Smokeless tobacco use		
Ever use		
Yes (n=874)	-2.0 (-3.5 - -0.5)	1.2 (1.01 - 1.6)
No (n=3606)	1	1

Table 3.28: Age and Sex-Adjusted Association between Biological Parameters and eGFR and Suspected CKDu

Parameter	eGFR	Suspected CKDu
	Age & Sex adjusted Coefficient (95% CI)	Age & Sex adjusted OR (95% CI)
BMI (n=4461)	0.01 (-0.10 - 0.12)	0.9 (0.9 - 1.0)
Body fat % (n=4460)	0.12 (0.04 - 0.19)	0.9 (0.9 - 1.0)
Body water % (n=4417)	-0.2 (-0.3 - -0.1)	1.01 (1.01 - 1.04)

Table 3.29: Age and Sex-Adjusted Association between History of CKD among Parents or Siblings and eGFR and Suspected CKDu

History of CKD among parents or siblings (n=4480)	eGFR	Suspected CKDu
	Age & Sex adjusted Coefficient (95% CI)	Age & Sex adjusted OR (95% CI)
Yes (n=1472)	-3.7 (-4.9 - -2.6)	1.3 (1.06 - 1.5)
No (n=3008)	1	1

Table 3.30: Age and Sex-Adjusted Association between the Drinking Water Sources (within the top three most frequently used sources for at least 10 years as reported by the respondents) and eGFR and Suspected CKDu

Variable	eGFR	Suspected CKDu
	Age & Sex adjusted Coefficient (95% CI)	Age & Sex adjusted OR (95% CI)
Deep well (n=4480)		
Yes (n=3396)	-1.6 (-2.9 - -0.4)	0.8 (0.7 - 1.1)
No (n=1084)	1	1
Shallow wells(n=4480)		
Yes (n=371)	0.8 (-1.1 - 2.8)	0.9 (0.6 - 1.2)
No (n=4109)	1	1
Tube well(n=4480)		
Yes (n=454)	-0.9 (-2.7 - 0.9)	1.4 (1.05 - 1.9)
No (n=4026)	1	1
Tanks (n=4480)		
Yes (n=13)	5.0 (-5.1 - 15.2)	1.6 (0.4 - 5.6)
No (n=4467)	1	1
Community water supply projects (n=4480)		
Yes (n=70)	-2.6 (-7.1 - 1.8)	1.2 (0.6 – 2.5)
No (n=4410)	1	1
Agriculture water (n=4480)		
Yes (n=01)	-3.6 (-40.3 - 33.0)	0.0

No (n=4479)	1	1
Water canals (n=4480)		
Yes (n=01)	-12.6 (-49.3 - 24.0)	0.0
No (n=4479)	1	1
RO water (n=4480)		
Yes (n=24)	2.5 (-3.8 - 8.9)	0.3 (0.07 – 1.6)
No (n=4456)	1	1

Table 3.31: Age and Sex-Adjusted Association Between Ever Occupied in Any Farming as Full Time or Part Time and its Duration and eGFR and Suspected CKDu

Variable	eGFR	Suspected CKDu
	Age & Sex adjusted Coefficient (95 CI)	Age & Sex adjusted OR (95 CI)
Ever occupied in any farming and duration		
No farming	1	1
Part time farming for < 10 yrs	-2.1 (-4.3 - 0.05)	1.1 (0.7 - 1.8)
Part time farming for ≥ 10 yrs	-2.6 (-4.4 - -0.7)	1.4 (1.02 - 2.0)
Full time farming for < 10 yrs	-2.7 (-4.9 - -0.6)	1.4 (0.8 - 2.2)
Full time farming for ≥ 10 yrs	-4.8 (-6.4 - -3.2)	1.2 (0.9 - 1.7)

Table 3.32: Age and Sex-Adjusted Association between Use of Medication and eGFR and Suspected CKDu

Medication	eGFR	Suspected CKDu
	Age & Sex adjusted Coefficient (95% CI)	Age & Sex adjusted OR (95% CI)
Long-term use of painkillers like paracetamol as reported by the respondents (n=4480)		
Yes (n=284)	-0.1 (-2.3 - 2.1)	0.7 (0.5 – 1.1)
No (n=4192)	1	1

Current use of angiotensin-converting enzyme inhibitors verified by the medical reports (n=4480)		
Yes (n=34)	1.4 (-4.8 - 7.8)	0.9 (0.3 - 2.2)
No (n=4446)	1	1

Table 3.33: Age and Sex-Adjusted Association Between Consumption of Selected Food Items (based on self- reported consumption of the specific food item 3 or more days during the week prior to the survey) and eGFR and Suspected CKDu

Variable	eGFR	Suspected CKDu
	Age & Sex adjusted Coefficient (95% CI)	Age & Sex adjusted OR (95% CI)
Lotus root (n=4480)		
Yes (n=08)	-1.1 (-14.1 - 11.8)	0.0
No (n=4472)	1	1
Water lily seed powder (n=4480)		
Yes (n=105)	0.6 (-2.9 - 4.2)	1.1 (0.6 – 2.2)
No (n=4375)	1	1
Kohila (n=4480)		
Yes (n=17)	0.6 (-2.9 - 4.2)	0.9 (0.2 – 4.2)
No (n=4463)	1	1
Kankun(n=4480)		
Yes (n=171)	0.3 (-2.5 - 3.2)	0.6 (0.3 – 1.0)
No (n=4309)	1	1
Kakiri(n=4480)		
Yes (n=251)	-2.3 (-4.7 - 0.04)	0.9 (0.6 – 1.4)
No (n=4229)	1	1
Olu seeds(n=4480)		
Yes (n=13)	-8.5 (-18.7 - 1.6)	2.7 (0.7 – 10.8)
No (n=4467)	1	1
Lake fish(n=4480)		

Yes (n=1355)	0.5 (-0.6 - 1.7)	0.9 (0.7 – 1.1)
No (n=3125)	1	1
Star fruit(n=4480)		
Yes (n=17)	2.2 (-6.6 - 11.1)	0.4 (0.05 – 3.4)
No (n=4463)	1	1

Table 3.34: Age and Sex-Adjusted Association Between the Amount of Drinking Water Consumed per a Usual Day as Reported by the Respondents and eGFR and Suspected CKDu

Variable	eGFR	Suspected CKDu
	Age & Sex adjusted Coefficient (95% CI)	Age & Sex adjusted OR (95% CI)
Amount of water per day (Liters) (n=4480)		
Less than 3 liters (n=2553)	1	1
3 or more liters (n=1927)	-2.0 (-3.2 - -0.9)	1.2 (0.9 – 1.4)

Table 3.35: Age and Sex-Adjusted Association between Exposure to Chemical Fertilizers/Weedicides/ Pesticides (self-reported 'non-rare' use for at least 5 years) and eGFR and Suspected CKDu

Variable	eGFR	Suspected CKDu
	Age & Sex adjusted Coefficient (95% CI)	Age & Sex adjusted OR (95% CI)
Chemical fertilizers(n=4480)		
Yes (n= 371)	-2.1 (-4.1 - -0.1)	1.1 (0.8 – 1.5)
No (n=4109)	1	1
Weedicides(n=4480)		
Yes (n=233)	-2.7 (-5.2 - -0.1)	1.2 (0.8 – 1.7)
No (n=4247)	1	1
Pesticides(n=4480)		
Yes (n=241)	-2.1 (-4.6 - 0.4)	1.2 (0.8 – 1.8)
No (n=4239)	1	1

Any chemical use (n=4480)		
Yes (n=386)	-2.01 (-0.03- 4.08)	1.1 (0.8 – 1.6)
No (n=4094)	1	1

Table 3.36: Age and Sex-Adjusted Association between Duration of Work Done Outdoors in the Sunlight (self-reported hours of outdoor work per usual day and days per usual week in the sunlight) and eGFR and Suspected CKDu

Work outside the sun per week (n=4480)	**eGFR**	**Suspected CKDu**
	Age & Sex adjusted Coefficient (95% CI)	**Age & Sex adjusted OR (95% CI)**
Less than 20 hrs per week (n=2972)	1	1
20 hrs or more per week (n=1508)	-0.5 (-1.7 - 0.6)	0.8 (0.7 – 1.0)

Table 3.37: Age and Sex-Adjusted Association Between History of Envenomation Following a Snake Bite (history of being admitted to a western medical facility and kept under observation for complications for more than 24 hours or having received anti-venom treatment)

Snake (identity-based on self-report of the respondent)	**eGFR**	**Suspected CKDu**
	Age & Sex adjusted Coefficient (95% CI)	**Age & Sex adjusted OR (95% CI)**
Cobra(n=4480)		
Yes (n=11)	0.5 (-10.5 - 11.6)	0.6 (0.1 – 3.3)
No (n=4469)	1	1
Viper(n=4480)		
Yes (n=109)	-1.2 (-4.8 - 2.3)	0.9 (0.5 – 1.6)
No (n=4371)	1	1
Common krait(n=4480)		
Yes (n=04)	-23.2 (-41.6 - -4.9)	9.0 (0.9 – 91.3)
No (n=4476)	1	1
Kuna katuwa(n=4480)		
Ye (N=113)	-2.0 (-5.5 - 1.4)	1.3 (0.7 – 2.3)

No (n=4367)	1	1
Scorpion(n=4480)		
Yes (N=16)	-3.7 (-12.9 - 5.4)	0.9 (0.2 – 4.6)
No (n=4464)	1	1
Any snake (n=4480)		
Yes (n=227)	-1.8 (-4.3 - 0.6)	1.3 (0.7 – 1.7)
No (n=4253)	1	1

Ever use of tobacco, ever use of alcohol, ever use of smokeless tobacco, increasing body water %, history of CKD among parents or siblings, part-time farming for ≥ 10 yrs were shown to be significant risk factors for Suspected CKDu and also significant predictors for decreasing eGFR.

Multivariate model to assess adjusted predictors of eGFR (Table 3.37) was assessed separately for males and females.

Table 3.38: Predictors of eGFR using Multiple Linear Regression

Variable	Coefficient for males (n=1396)				Coefficient for females(n=3084)			
	Coefficient	p	95% CI		Coefficient	p	95% CI	
Age categories (Years)								
18 - 40	1				1			
41 - 50	-10.244	**	-13.476	-7.013	-12.866	**	-14.650	-11.083
51 - 60	-20.355	**	-24.111	-16.598	-21.425	**	-23.543	-19.307
61 - 70	-32.794	**	-36.867	-28.720	-29.901	**	-32.422	-27.380
> 70	-42.260	**	-48.216	-36.303	-45.067	**	-49.306	-40.829
Number of years of education in schools and in higher education institutes	0.401	0.011	0.090	0.712	0.090	0.198	-0.047	0.227
Marital status								
Currently Married	1				1			
Other	-4.640	0.018	-8.495	-0.786	-1.874	0.043	-3.691	-0.058

Current use of Angiotensin-converting enzyme inhibitors verified by the medical reports								
No	1				1			
Yes	-9.747	0.307	-28.450	8.956	0.456	0.891	-6.072	6.985
Ever smoking								
No	1				1			
Yes	-4.460	0.001	-7.038	-1.881	-16.275	0.001	-26.077	-6.472
Ever use of smokeless tobacco products								
No	1				1			
Yes	-3.073	0.012	-5.477	-0.668	1.237	0.286	-1.035	3.509
Ever use of alcohol								
No	1				1			
Yes	-1.278	0.404	-4.284	1.727	-4.687	0.131	-10.774	1.400
BMI	-0.574	0.007	-0.988	-0.160	-0.209	0.071	-0.436	0.018
Body water %	-0.786	**	-1.195	-0.376	0.012	0.92	-0.231	0.255
Body fat %	6.701	**	3.470	9.932	0.217	0.818	-1.635	2.069
History of CKD among parents or siblings								
No	1				1			
Yes	-4.597	**	-7.086	-2.107	-3.815	**	-5.214	-2.416
Ever occupied in any farming and duration								
No	1				1			
Farming for < 10 yrs	-5.650	0.009	-9.888	-1.412	-4.671	**	-6.643	-2.699
Farming for ≥ 10 yrs	-9.827	**	-13.822	-5.832	-6.991	**	-8.813	-5.170
History of envenomation following any snake bite								
No	1				1			

Yes	0.275	0.904	-4.188	4.737	-3.355	0.044	-6.620	-0.090
Drinking water from deep wells (within the top three most frequently used sources for at least 10 years as reported by the respondents)								
No	1				1			
Yes	-3.019	0.017	-5.492	-0.547	-0.622	0.374	-1.995	0.751
Self- reported consumption of olu seeds 3 or more days during the week prior to the survey								
No	1				1			
Yes	2.886	0.517	-5.853	11.625	0.901	0.669	-3.225	5.026
Chemical fertilizers exposure (Any chemical with non-rare exposure more than 5 years)								
No	1				1			
Yes	-1.018	0.527	-4.176	2.140	0.114	0.941	-2.907	3.134
Work outside the sun per week								
Less than 20 hrs per week	1				1			
20 hrs or more per week	3.392	0.008	0.901	5.882	0.867	0.29	-0.739	2.473
Amount of water per day (Liters)								
Less than 3 litres	1				1			
3 or more liters	-3.019	0.017	-5.492	-0.547	-0.622	0.374	-1.995	0.751

[Adjusted by Sex, Number of years of education, Marital status, Use of ACEI, smoking status, Smokeless tobacco consumption, Alcohol consumption, Body water %, BMI, Family history of CKD, envenomation, Water intake from deep well, consumption of olu seeds, work outside the sun, Consumption of water, Age categories, Farming, Any chemical exposure.]

***** = p< 0.01***

Being in the age categories of 41 – 50years, 51 – 60 years, 61-70 years and > 70 years, currently not married, ever smoking, history of CKD among parents or siblings and both

farming for >10 years and < 10 years were significant predictors for decreasing eGFR when adjusted for the effect of confounding was seen in **both** males and females.

Lesser number of years of education in schools and in higher education institutes, ever use of smokeless tobacco, low % of body water, low BMI and low % of body fat, drinking water from deep wells, working outside the sun 20hours or more per week and drinking 3 or more litres of water per day were significant predictors only among **males** for decreasing eGFR when adjusted for the effect of confounding while history of envenomation reported by the respondents was the significant predictor seen only among **females** for decreasing eGFR when adjusted for the effect of confounding.

Being a male showed a significantly higher risk for Suspected CKDu in multivariate modelling. Adjusted risk/protective factors for Suspected CKDu (Table 3.38) were assessed separately for males and females.

Table 3.39: Risk/Protective Factors for Suspected CKDu Using Multiple Logistic Regressions

Variable	Male Adjusted OR				Female Adjusted OR			
	OR	p	95% CI		OR	p	95% CI	
Age categories (Years)								
18 - 40	1				1			
41 - 50	2.329	0.005	1.295	4.190	1.656	0.02	1.082	2.535
51 - 60	3.746	0	2.038	6.887	2.875	0	1.833	4.508
61 - 70	7.449	0	4.015	13.818	5.937	0	3.738	9.429
> 70	13.276	0	6.178	28.530	14.442	0	7.845	26.586
Number of years of education in schools and in higher education institutes	0.947	0.037	0.900	0.997	0.991	0.47	0.968	1.015
Marital status								
Currently Married	1				1			
Other	1.122	0.723	0.595	2.114	0.833	0.275	0.599	1.157

Current use of angiotensin-converting enzyme inhibitors verified by the medical reports								
No	1				1			
Yes	1.388	0.738	0.203	9.486	0.818	0.703	0.291	2.299
Ever smoking								
No	1				1			
Yes	1.498	0.022	1.059	2.118	2.702	0.181	0.629	11.598
Ever use of smokeless tobacco products								
No	1				1			
Yes	1.562	0.006	1.133	2.153	0.990	0.962	0.648	1.512
Ever use of alcohol								
No	1				1			
Yes	0.919	0.696	0.601	1.404	1.530	0.445	0.514	4.552
BMI	0.990	0.732	0.934	1.049	1.032	0.413	0.958	1.111
Body water %	1.073	0.032	1.006	1.145	1.000	0.988	0.959	1.043
Body Fat %	1.017	0.323	0.984	1.050	0.994	0.85	0.938	1.054
History of CKD among parents or siblings								
No	1				1			
Yes	1.361	0.077	0.967	1.917	1.321	0.051	0.998	1.747
Ever occupied in any farming and duration								
No	1				1			
Farming for < 10 yrs	2.397	0.058	0.970	5.923	1.362	0.196	0.853	2.176
Farming for ≥ 10 yrs	3.175	0.005	1.420	7.101	1.218	0.323	0.824	1.801
History of envenomation following any snake								

bite								
No	1				1			
Yes	0.966	0.906	0.544	1.715	1.283	0.418	0.702	2.342
Drinking water from deep wells (within the top three most frequently used sources for at least 10 years as reported by the respondents)								
No	1				1			
Yes	1.374	0.076	0.967	1.952	0.823	0.229	0.598	1.131
Self- reported consumption of olu seeds 3 or more days during the week prior to the survey								
No	1				1			
Yes	2.719	0.059	0.963	7.673	0.548	0.325	0.165	1.816
Chemical fertilizers exposure (Any chemical with non-rare exposure more than 5 years)								
No	1				1			
Yes	1.210	0.342	0.817	1.793	0.996	0.991	0.528	1.881
Work outside the sun per week								
Less than 20 hrs per week	1				1			
20 hrs or more per week	0.629	0.007	0.449	0.880	0.782	0.151	0.560	1.093
Amount of water per day (Liters)								
Less than 3 litres	1				1			
3 or more liters	1.374	0.076	0.967	1.952	1.152	0.336	0.864	1.535

[Adjusted by Sex, Number of years of education, Marital status, Use of ACEI, smoking status, Smokeless tobacco consumption, Alcohol consumption, Body water %, BMI, Family history of CKD, envenomation, Water intake from deep well, consumption of olu seeds, work outside the sun, Consumption of water, Age categories, Farming, Any chemical exposure.]

***** = p< 0.01***

Being in the age categories of 41-50 years, 51-60 years, 61-70 years and > 70 years was a significant risk factor for Suspected CKDu when adjusted for the effect of confounding in **both** the sexes.

Lesser number of years of education in schools and in higher education institutes, ever smoking, ever use of smokeless tobacco, high body water %, farming for ≥ 10 years and working outside the sun 20 hours or more per week were risk factors for Suspected CKDu only among **males** when adjusted for the effect of confounding while none were found to be the risk factors for Suspected CKDu only among **females**.

4 Conclusions

This is the first-ever study to use the three-level Sri Lankan operational case definition for CKDu since its publication in 2016. The estimates of the prevalence of Suspected CKDu in the study areas show that it is a considerable public health problem with an estimated overall prevalence of suspected CKDu of 13.3%. This study has confirmed the male preponderance of the disease, with the male prevalence being almost the twice that of the females (males-19.9%; females 10.5%).

When hypertensives were excluded using the definition modified to capture all possible hypertension (i.e. both probable and possible hypertension), as well as diabetes, the prevalence of suspected CKDu dropped considerably from 13.3% to 9.5% (Males 14.2%; Females- 7.5%).

The presence of essential screening criteria and a known cause for CKD as identified by the present survey was considered as a proxy indicator for the prevalence of CKD with a known cause in the present study. The prevalence for CKD with a known cause, defined in this manner was 6.7% (Male – 8.6%, Female – 5.8%), although it should be acknowledged that onetime assessment of essential screening criteria is inadequate to confirm CKD. Overall; we found that the prevalence of CKD with a known cause among males and females were approximately half that of Suspected CKDu.

Out of the all five study areas “Puhudivula” (area 4) showed a statistically significant low level of mean eGFR compared to others. However, the mean eGFR levels of males in all five areas were similar. In three out of five areas the males showed significantly lower mean eGFR compared to females in the same areas.

The survey identified several modifiable and non-modifiable risk factors for Suspected CKDu. Being a male showed a significantly higher risk for Suspected CKDu. Being in the age categories of 41-50 years, 51-60 years, 61-70 years and > 70 years was a significant risk factor for Suspected CKDu when adjusted for the effect of confounding in both the sexes.

Lesser number of years of education in schools and in higher education institutes, ever smoking, ever use of smokeless tobacco, high body water %, farming for ≥ 10 years and working outside the sun 20 hours or more per week were risk factors for Suspected CKDu only among males when adjusted for the effect of confounding while none were found to be the risk factors for Suspected CKDu only among females.

The environmental exposures and occupational related factors studied in the present survey were based on self-reports and were proxy measures. Overall, farming was the main occupational/environmental risk factor for Suspected CKDu. Particular exposures associated with farming (e.g. pesticide exposure, heat exposure) did not appear to explain the increased risk from farming, but the available exposure information was limited, and these findings may change when better exposure data are obtained.

It should be noted that the present study adopted a cross-sectional design which does not allow the examination of the temporal relationship between the identified significant risk/protective factors and the Suspected CKDu status.

5 Recommendations

We recommend further surveys in other districts of the country using the same protocol to estimate the prevalence of Suspected CKDu to better understand the burden and distribution of the problem.

The modifiable risk factors identified in this study are recommended to be used in the ongoing primary or secondary preventive activities. This study provides an additional 'fact' to be emphasized in advocacy and communication efforts of tobacco control.

The environmental exposures and occupational related factors studied in the present survey were based on self-reports and were proxy measures and the cross-sectional design used precluded assessment of the temporal relationship of the identified risk factors. Thus, it is recommended that a prospective cohort study is conducted using quantitative measurements of environmental exposures including agrochemical residues, weedicides and pesticides, heat exposure, heavy metals in water, and infections.

6 References

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7 Annexures

Annexure i: The case definition of Chronic Kidney Disease of unknown aetiology (CKDu)

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சுவசிரிபாய
SUWASIRIPAYA

எனது இல) My Number: EPID/449(v)/2016
My No.)

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உமது இல)
Your No. :)

දිනය) December 24, 2016
திகதி)
Date)

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சுகாதார, போசணை மற்றும் சுதேச வைத்திய அமைச்சு
Ministry of Health, Nutrition & Indigenous Medicine

All PDHS, RDHS,
All Directors/Medical Superintendents of Teaching, General and Base hospitals,
All Regional Epidemiologists,
All Consultant Nephrologists,
All Consultant Physicians,

Criteria for diagnosing Chronic Kidney Disease of Uncertain-aetiology

The criteria for establishing diagnosis of "Chronic Kidney Disease of Uncertain-aetiology" (CKDu) were agreed upon in a joint deliberation of Epidemiology Unit of the Ministry of Health, Sri Lanka Society of Nephrologists, National Science Foundation of the Ministry of Science and Technology and the World Health Organization country office for Sri Lanka.

Please follow the under-mentioned criteria in establishing diagnosis of CKDu and in record keeping including the Indoor Morbidity Mortality Registers and the National Renal Registry.

Three levels of case definition are as under:

Suspected CKDu

- Essential criteria: eGFR < 60 mL/min using CKD EPI equation: One time measurement using standardized methods for creatinine measurement OR albuminuria > = 30 mg/g

  Exclusion criteria to identify suspect CKDu among those satisfying the above criteria

  i. Urine protein: creatinine ratio > 2 g/g creatinine **OR** urine albumin: creatinine ratio >0.3g/g creatinine

  ii. Hypertensives on treatment with more than two drugs **OR** untreated blood pressure of more than 160/100 mmHg (preferably using electronic BP apparatus, sitting position, at least two readings one minute apart)

  iii. History of diabetes **OR** being on treatment **OR** capillary random plasma glucose >200 mg/dL

10 JAN 2017 H/S

385, පූජ්‍ය බද්දේගම විමලවංශ හිමි මාවත, කොළඹ 10. 385, வணக்கத்துக்குரிய பத்தேகம விமலவங்ச தேரோ மாவத்தை, கொழும்பு 10.
385. Rev. Baddegama Wimalawansa Thero Mawatha, Colombo 10. Sri Lanka.

- Repeat assessment of eGFR after 12 weeks and eGFR < 60 mL/min using CKD EPI equation **OR** Repeat albuminuria > = 30 mg/g

- Satisfying the exclusion criteria above for 'Suspected CKDu'

Exclusion criteria to identify probable CKDu among those satisfying above criteria

i. Diabetes based on fasting plasma glucose >126 mg/dL

ii. Polycystic kidney, congenital malformation, obstructive nephropathy by ultrasound imaging

iii. Haematuria of >10 red blood cells/HPF

iv. Other known causes of CKD such as autoimmune diseases, glomerular diseases, kidney stones or any other obstruction in the urinary tract based on the clinical evaluation **and** laboratory investigations

Confirmed CKDu

- All the above mentioned criteria for probable CKDu
  AND (in addition)

- Histopathological features consistent with CKDu on biopsy, preferably the demonstration of absence of immune deposits

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Ministry of H... Medicine
...asiripaya
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Colombo 10.

Dr. Jayasundara Bandara
Actg. Director General of Health Services

Cc:
1. DDH (PHS) 1
2. Sri Lanka Society of Nephrologists
3. Ceylon College of Physicians
4. World Health Organization (Country Office)
5. National Science Foundation

Annexure ii*:* The interviewer-administered questionnaire used in the household survey

Cross-sectional Survey to estimate the burden and to understand the aetiology of CKDu in Sri Lanka

Serial Number : Sticker to be pasted

GN area Code : ……

Household Number
(as in the voter's list) : ……
Interviewer ID : ……

Date : ……

GPS Coordinates : Long……
Latt……

Name:
……
……
Address:…….
……
NIC
……

Section 1

Demographic and socio-economic information of the participant

1. Sex *of the respondent* : Female / Male

2. What is your date of birth? : YYYY/MM/DD (If unable to remember the exact date of birth, obtain the information from the national identity card.)

3. What is your ethnicity:
   - Sinhala ☐
   - Tamil ☐
   - Muslim ☐
   - Other ……

4. What is the highest level of education you have completed?
   - No formal Schooling ☐
   - 1-5 Grade ☐
   - 6-11 Grade ☐
   - GCE O/L passed ☐
   - GCE A/L passed ☐
   - Certificate/Diploma ☐
   - Degree ☐

   4.1. In total, how many years have you spent at school and in full time study (excluding pre-school)? …… years

5. What is your Marital Status : Married ☐ | Unmarried ☐ | Divorced ☐ | Widowed ☐

6. What is your current employment status?
   - Full-Time – Public Sector ☐
   - Full Time- Private Sector ☐
   - Self-Employed ☐
   - Casual Employment ☐
   - Student ☐
   - Unpaid Family Work ☐
   - Retired ☐
   - Unemployed ☐

   6.1. If you are working what is your main occupation? ……

7. Have ever engaged in the following farming/industries as the main or part-time occupation?

No	Type of farming (a)			Duration of years (b)
I	Paddy farming	Yes	*go to b*	
		No	*Go to ii*	
ii	Subsistence vegetable farming (other than Chena cultivation)	Yes	*Go to b*	
		No	*go to iii*	
iii	Chena cultivation	Yes	*Go to b*	
		No	Go to q8	

8. What is your average monthly **personal** income? *(if the income is not on monthly basis estimate a monthly amount based on the amount and frequency reported)*

- No income at all ☐
- Less than Rs.5,000 ☐
- Rs.5,000-10,000 ☐
- Rs.10,001-15,000 ☐
- Rs.15,001-20,000 ☐
- Rs.20,001-25,000 ☐
- Rs.25,001-30,000 ☐
- More than Rs.30,000 ☐

Section 2

9. Now I would like to ask you some details of illnesses that you may have. Please mention whether you suffer from any of the following diseases. If you have any, please provide me with any diagnosis cards/ clinic records/ clinic books or any other documentation regarding this.

	Disease	Have you ever been told that you have this disease? (a)		Is this confirmed by medical records (diagnosis card/clinic book/ drug sheets) (b)		Age at diagnosis (c)	(d)
I	Diabetes	Yes	*go to b*	Yes			Are you taking any drugs for the disease (Yes/No)
		No	*Go to ii*	No			
ii	Hypertension	Yes	*go to b*	Yes			Are you taking any drugs for the disease (Yes/No)
		No	*Go to iii*	No			
iii	Ischemic Heart Disease	Yes	*go to b*	Yes			Are you taking any drugs for the disease (Yes/No)
		No	*Go to iv*	No			
		No	*Go to 10*	No			

10. Does anyone of your immediate family members (father/ Mother/ brothers/ sisters) have history of CKD / CKDu

- Yes ☐ No ☐

Section 3

11. Now I would like to ask you some details of the drugs that you may be taking. Please mention whether you are taking any of the drugs mentioned below. If you are using, please provide me with any diagnosis cards/ clinic records/ clinic books or any other documentation regarding this.

	Drugs	**Have you ever been taking the following drugs on a regular basis (a)**		**Is this confirmed by medical records (diagnosis card/clinic book/ drug sheets) (b)**		**Duration in years (c)**
I	NSAIDs (need to give common trade names)	Yes	*go to b*	Yes	*go to c*	
		No	*Go to ii*	No	*go to c*	
ii	Any other painkillers(need to give common trade names)	Yes	*go to b*	Yes	*go to c*	
		No	*Go to iii*	No	*go to c*	
iii	Amitriptyline (need to give common trade names)	Yes	*go to b*	Yes	*go to c*	
		No	*Go to iv*	No	*go to c*	
iv	Lithium(need to give common trade names)	Yes	*go to b*	Yes	*go to c*	
		No	*Go to v*	No	*go to c*	
v	Benzodiazepines(need to give common trade names)	Yes	*go to b*	Yes	*go to c*	
		No	*Go to vi*	No	*go to c*	
vi	Angiotensin-converting enzyme inhibitors(need to give common trade names)	Yes	*go to b*	Yes	*go to c*	
		No	*Go to vii*	No	*go to c*	
vii	Herbal or traditional remedies(need to give common local names)	Yes	*go to b*	Yes	*go to c*	
		No	*Go to Q. 12*	No	*go to c*	

12. Now I would like to ask you some details about your diet. Please consider the ***last 7 days*** and state how frequently had the following food items either at home or outside the home. Always the number of days of food consumption is considered (min =0 and max =7)

No	**Food item**	**Please state the number of days you consumed the food item during the last week. Put an "X" in the correct box**							
		0	1	2	3	4	5	6	7
1	Lotus Root								
2	Water Lily seed powder								
3	Lake fish								
4	Starfruit								
5	Meat (beef, pork or any other red meat)								
6	Chicken								

13. Now I am going to ask you some questions about tobacco use.

13.1. Do you **currently** smoke any **tobacco** products, such as cigarettes or Beedee? Yes / No (go to Q.13.4)

13.2. How old were you when you first started smoking? ……

13.3. Do you currently smoke tobacco products daily? Yes / No

13.4. In the past, did you ever smoke any tobacco products? Yes / No (go to Q.14)

13.5. In the past, did you ever smoke daily? Yes / No

14. Now I am going to ask you some questions about smokeless tobacco use [such as chewing tobacco, betel with tobacco, babul, snuff]

14.1. Do you **currently** use any smokeless **tobacco** products? Yes/ No (go to Q.14.3)

14.2. Do you currently use smokeless tobacco products daily? Yes / No

14.3. In the past, did you ever use smokeless tobacco products? Yes / No (go to Q.15)

14.4. In the past, did you ever use smokeless tobacco products daily? Yes / No

15. Now I am going to ask you some questions about alcohol use (such as arrack, kasippu, toddy, beer, spirits or wine). During the past 12 months, how frequently have you had at least one standard alcoholic drink?

- Daily ☐
- 5-6 days per week ☐
- 3-4 days per week ☐
- 1-2 days per week ☐
- 1-3 days per month ☐
- Less than once a month ☐
- Not at all ☐
- Refused ☐

16. The following questions are about your water source.

Please state your main water source used for drinking and cooking purposes. Further, state how long you have been using each water source. You may have multiple water sources.

No	**Source**	**Duration of use**					**Rank the water sources according to the most used to least used**
		< 5 years	**6-10 yrs**	**11-15 yrs**	**16-20 yrs**	**> 20 yrs**	
1	Deep Well						
2	Shallow Wells						
3	Tubewell						
4	Pipe water from the water board						
5	Water from reservoirs						
6	Community-Based water supply						
7	RO water						
8	Other						

16.1. Usually, how much of water do you consume per day? …… Litres

17. Have you ever been exposed to chemical fertilizers/weedicides/ pesticides? Yes / No (skip to Q.18)

Please state the type and the duration of exposure of the following chemical fertilizers/weedicides/ pesticides

No	**Type**	**Frequency of exposure**			**Duration of exposure**		
		Rarely	**Sometimes**	**Often**	**< 5 yrs**	**5-10 yrs**	**>10 yrs**
1	chemical fertilizers						
2	weedicides						
3	pesticides						
4	Other						

18. On a typical working day, how many hours do you usually work under the sun? …… Hrs

18.1. How many such days per week do you work under the sun? ……

19. Have you ever been bitten by a snake? Yes / No (End questionnaire)

No	Snake	Year	Needed hospital admission		Management at hospitalization (Use the relevant code)
			Yes	No	
1	Cobra				
2	Viper				
3	Common krait				
4	Other				

Management at hospitalization

1. Only observed
2. Treated in the ward
3. Treated in the ICU/special unit

Annexure iii*:* Clinic Sheet- Survey to estimate the burden of CKDu in Sri Lanka

Cross-sectional Survey to estimate the burden and to understand the aetiology of CKDu in Sri Lanka

Serial Number: Sticker to be pasted

Interviewer Code : ……

Date: ……``````````````

Name:
……
……
Address:……
……
NIC……..

Part 4

Physical Examination

Height (m)	Device ID for height: ……	Value: ……	
Weight (kg)	Device ID for weight: ……	Value: ……	
Have you eaten yet today?	**Yes / No**	If yes, how many hours/minutes before	**H:……., M:…….**
Are you on pacemaker	**Yes / No**	**For women only:** Are you pregnant?	**Yes / No**
Bioimpedance (DO NOT TEST IN PREGNANT WOMEN AND THOSE WHO ARE ON PACEMAKERS)	Device ID for BIA ……		
	Bioimpedance value (Hz used by the machine)……		
	Bioimpedance outputs in kg or % - …… kg / %		
	Bioimpedance outputs • Fat mass: …… • Fat-free mass:……		
Blood pressure (mmHg)	Device ID for blood pressure: ……		
	Cuff Size : Small / Medium / Large		
	Reading 1	**Reading 2**	**Reading 3**
	Systolic……	Systolic……	Systolic……
	Diastolic……	Diastolic……	Diastolic……
During the past two weeks, have you been treated for **raised blood pressure**	**Yes / No**	During the past two weeks, have you been treated for **raised blood sugar**	**Yes / No**
Blood sugar (mg/dl)	Device ID ……	Value ……	

Annexure iv*:* Details of the distribution of the study population by the presence of each of the exclusion criteria to identify Suspected CKDu

Table 19e: Distribution of the Study Population by Presence of Exclusion Criteria to identify Suspected CKDu and Study Areas

Feature	Area 1		Area 2		Area 3		Area 4		Area 5		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Urine albumin: creatinine ratio >0.3 g/g creatinine (n=4803)												
Yes	17	1.9	26	2.6	22	2.4	13	1.3	32	3.3	110	2.3
No	891	98.1	982	97.4	904	97.6	987	98.7	929	96.7	4693	97.7
Hypertensive on treatment with more than two drugs OR untreated blood pressure of more than 160/100 mmHg												
Yes	67	7.4	49	4.9	49	5.3	69	6.9	46	4.8	277	5.8
No	841	92.6	959	95.1	877	94.7	931	93.1	915	95.2	4526	94.2
History of diabetes OR being on treatment OR capillary random plasma glucose >200 mg/dL (n=4803)												
Yes	99	10.9	134	13.3	86	9.3	83	8.3	68	7.1	470	9.8
No	809	89.1	874	86.7	840	90.7	917	91.7	893	92.9	4333	90.2

Table 19f: Distribution of the Study Population by the Measured Blood Pressure (using electronic BP apparatus, sitting position, an average of three readings one minute apart) and Study Areas

Blood Pressure categories(n=4803)	Area 1		Area 2		Area 3		Area 4		Area 5		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
Systolic BP												
<160	975	96.7	896	96.8	955	95.5	929	96.7	975	96.7	4616	96.1
≥ 160	33	3.3	30	3.2	45	4.5	32	3.3	33	3.3	187	3.9
Diastolic BP												
<100	986	97.8	912	98.5	975	97.5	947	98.5	986	97.8	4693	97.7
≥ 100	22	2.2	14	1.5	25	2.5	14	1.5	22	2.2	110	2.3

Table 19g: Distribution of the Study Population by the Measured Capillary Random Blood Sugar Levels and Study Areas

Capillary Random Blood Glucose (n=4803)	Area 1		Area 2		Area 3		Area 4		Area 5		Total	
	N	%	N	%	N	%	N	%	N	%	N	%
≤200	857	94.4	939	93.2	885	95.6	957	95.7	919	95.6	4557	94.9
> 200	51	5.6	69	6.8	41	4.4	43	4.3	42	4.4	246	5.1

Annexure v*:* Definition of CKDu according to DEGREE protocol

Inclusion criteria

eGFR<60

Exclusion criteria

i. **'Possible Hypertension'**

- BP more than 140/90 at the time of the survey
- being on anti-hypertension drugs (any number)
- Self-reported as having hypertension with evidence of medical records

Iii History of diabetes OR being on treatment OR capillary random plasma glucose >200 mg/dL

Annexure vi*:* Prevalence of CKDu according to DEGREE protocol

Table 19i: Prevalence of CKDu according to DEGREE protocol among total population (male and female) by age categories and Study Areas

Prevalence	Area 1		Area 2		Area 3		Area 4		Area 5		Total	
	%	CI	%	CI	%	CI	%	CI	%	CI	%	CI
CKDu according to DEGREE protocol (n=202)												
18-30 years	0		0.7	0.0 – 2.1	0.7	0.0 – 2.1	0		0		0.3	0.0 – 0.7
31-40 years	0		2.8	0.3 – 5.3	0.6	0.0 – 1.8	0.5	0.0 – 1.6	0.4	0.0 – 1.3	0.8	0.2 – 1.4
41-50 years	1.6	0.0 – 3.9	4.1	1.3 – 6.9	4.0	1.1 – 7.0	5.4	1.9 – 8.8	4.2	1.1 – 7.3	4.0	2.6 – 5.3
51-60 years	3.5	0.1 – 6.9	6.4	1.7 – 11.2	9.1	3.3 – 14.8	8.3	2.7 – 13.9	12.1	6.0 – 18.1	7.8	5.6 – 10.1
61-70 years	13.2	4.9 – 21.5	21.4	10.3 – 32.5	22.4	11.3 – 33.4	43.1	29.9 – 56.2	25.9	15.9 – 36.0	24.9	20.1 – 29.7
> 70	30.7	11.7 – 49.7	40.0	11.9 – 68.1	28.5	1.5 – 55.6	58.3	37.0 – 79.6	37.5	10.8 – 64.1	40.0	29.9 – 50.0
All	3.7	2.2 – 5.1	5.6	3.9 – 7.4	5.4	3.6 – 7.1	8.5	6.4 – 10.6	6.7	4.9 – 8.6	6.0	5.2 – 6.8

Table 19j: Prevalence of CKDu according to DEGREE protocol among Males by age categories and Study Areas

Prevalence	Area 1		Area 2		Area 3		Area 4		Area 5		Total	
	%	CI	%	CI	%	CI	%	CI	%	CI	%	CI
CKDu according to DEGREE protocol[3] (n=116)												
18-30 years	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
31-40 years	0	0.0	3.4	0.0 – 8.1	2.3	0.0 – 7.0	0	0.0	1.8	0.0 – 5.5	1.6	0.0 – 3.2
41-50 years	2.9	0.0 – 8.9	2.8	0.0 – 6.7	9.3	2.6 – 16.1	8.9	1.2 – 16.6	3.8	0.0 – 9.2	5.9	3.2 – 8.6
51-60 years	8.1	0.0 – 17.3	20.0	6.0 – 33.9	13.5	1.9 – 25.1	29.4	13.3 – 45.5	25.0	10.1 – 39.8	19.0	13.2 – 24.8
61-70 years	11.7	0.3 – 23.2	36.8	12.9 – 60.7	41.7	20.4 – 62.9	50.0	28.4 – 71.6	50.0	28.4 – 71.6	36.0	27.5 – 44.5
> 70	42.8	0.0 – 92.3	14.3	0.0 – 49.2	50.0	0.0 – 100.0	60.0	23.1 – 96.9	42.8	0.0 – 92.2	43.2	26.5 – 59.9

All	5.8	2.4 – 9.1	8.0	4.5 – 11.5	11.8	7.5 – 16.2	17.5	12.0 – 23.0	13.2	8.5 – 17.9	11.2	9.2 – 13.1

Table 19k: Prevalence of CKDu according to DEGREE protocol among Females by age categories and Study Areas

Prevalence	**Area 1**		**Area 2**		**Area 3**		**Area 4**		**Area 5**		**Total**	
	%	CI	%	CI	%	CI	%	CI	%	CI	%	CI
CKDu according to DEGREE protocol (n=86)												
18-30 years	0	0.0	0.9	0.0 – 2.6	0.8	0.0 – 2.5	0	0.0	0	0.0	0.3	0.0 – 0.8
31-40 years	0	0.0	2.4	0.0 – 5.0	0	0.0	0.6	0.0 – 1.9	0.6	0.0 – 1.7	0.7	0.1 – 1.3
41-50 years	2.5	0.0 – 6.0	5.5	1.2 – 9.9	1.0	0.0 – 3.1	3.7	0.1 – 7.5	3.6	0.1- 7.2	3.4	1.8 – 4.9
51-60 years	0	0.0	2.9	0.0 – 7.2	7.3	0.2 – 14.3	3.6	0.0 – 8.6	10.7	3.5- 17.8	4.9	2.5 – 7.3
61-70 years	13.5	1.9 - 25.1	12.9	0.4 – 24.4	6.9	0.0 – 16.7	37.9	19.1 – 56.7	13.0	2.9 – 23.2	16.3	10.7 – 21.8
> 70	41.7	8.9 – 74.4	66.7	12.5 – 100.0	12.5	0.0 – 42.0	50.0	16.8 – 83.2	33.3	0.0 – 87.5	40.9	25.8 – 56.0
All	2.7	1.2 – 4.2	4.4	2.5 – 6.3	2.1	0.7 – 3.4	4.9	3.0 – 6.9	4.1	2.4 – 5.8	3.7	2.9 – 4.5