

# Quality of Life and Health Status among those receiving Renal Replacement Therapy in Trinidad and Tobago. West Indies.

Sharlene Maria Sanchez (✉ [sanchezsharlene32@yahoo.com](mailto:sanchezsharlene32@yahoo.com))

Adventist University of Health Sciences Robert Arthur Williams Library <https://orcid.org/0000-0003-1512-4818>

Surujpal Teelucksingh

The University of the West Indies at Saint Augustine

Ronan Ali

The University of the West Indies at Saint Augustine

Henry Bailey

The University of the West Indies at Saint Augustine

George Legall

The University of the West Indies at Saint Augustine

---

## Research article

**Keywords:** Renal transplant, peritoneal dialysis, hemodialysis, EQ-5D-3L, KDQOL-36

**Posted Date:** January 26th, 2021

**DOI:** <https://doi.org/10.21203/rs.3.rs-19194/v2>

**License:**  This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

---

1 ORIGINAL RESEARCH

2 Sanchez et al

3

4 **Quality of Life and Health Status among those receiving**  
5 **Renal Replacement Therapy in Trinidad and Tobago.**  
6 **West Indies.**

7

8 **Sharlene Maria Sanchez**

9 Department of Medicine

10 North Central Regional Health Authority,

11 Arima General Hospital, Queen Mary Avenue,

12 Arima, Trinidad and Tobago, West Indies.

13

14 **Surujpal Teelucksingh**

15 Department of Clinical Medical Sciences, University of the West Indies, St. Augustine,

16 Trinidad and Tobago, West Indies.

17

18

19

20 **Ronan Ali**

21 Department of Clinical Medical Sciences, University of the West Indies, St. Augustine,

22 Trinidad and Tobago, West Indies

23

24 **Henry Bailey**

25 Department of Economics, University of the West Indies, St Augustine,

26 Trinidad and Tobago, West Indies.

27

28 **George Legall**

29 Department of Natural Sciences, University of the West Indies, St Augustine,

30 Trinidad and Tobago, West Indies.

31

32 Correspondence: Sharlene Maria Sanchez

33 Arima General Hospital,

34 Queen Mary Avenue, Arima,

35 Trinidad and Tobago, West Indies.

36 Tel 1-868-461-5724, 1-868-669-0044, 1-868-612-2454

37 Email : sanchezsharlene32@yahoo.com

38

39

40

41

42

43 **Abstract**

44

45 **Purpose:**

46 The determinants of quality of life for patients on renal replacement therapy vary across the world.  
47 In this cross sectional study, the factors accounting for a good quality of life in the resource-  
48 constrained twin-island of Trinidad and Tobago will be explored.

49 **Patients and methods:**

50 Five hundred and fifty three patients met inclusion criteria for the study. From the 103 patients  
51 receiving renal transplants, 100 participated and among the 84 on peritoneal dialysis, 80 took part  
52 in the study. Among the 1000-odd patients who were receiving hemodialysis, 350 were studied  
53 using convenience sampling. To be included, one had to be on renal replacement therapy for 3  
54 months or more and at least 18 years of age. The Kidney Disease Quality of Life (KDQOL-36) and  
55 the EuroQol (EQ-5D-3L) instruments were administered after demographic data was collected.  
56 Transplant recipients were further evaluated with the Kidney Transplant Questionnaire (KTQ).  
57 Inferential analysis of data included 95% confidence intervals, ordinary least squares regression,  
58 analysis of variance, pairwise correlation and Pearson's bivariate analysis. SPSS24, STATA14 and  
59 MINITAB18 were used.

60 **Results:**

61 Of the 530 patients, 52.5% were male, 37.5% were in the 56-65 years age group and 51.3% were  
62 of Indo-Trinbagonian descent. Hypertension (25.5%) and type 2 diabetes mellitus (62.0%) were  
63 reported as the main causes of kidney disease in the dialysis group. In the transplant category,  
64 chronic glomerulonephritis (45%) was the main aetiology of kidney disease. The KDQOL-36  
65 domain scores and significantly associated variables included modality of renal replacement,  
66 Charlson's Comorbidity Index, ethnicity, income and employment status. Transplant patients  
67 performed the best in the KDQOL-36 and EQ-5D-3L. Patients on peritoneal dialysis had a better

68 quality of life than hemodialysis patients. Increasing patients' access to renal transplantation or  
69 peritoneal dialysis will markedly improve health status for the number of years on renal  
70 replacement therapy. Among patients on hemodialysis, an arteriovenous fistula or graft significantly  
71 impacted on quality of life.

72 **Conclusion:**

73 Renal transplant recipients enjoy the best quality of life and health state among patients on renal  
74 replacement therapy in Trinidad and Tobago. Given the limitations in resources, patients on  
75 peritoneal dialysis also enjoy a good quality of life while the presence of an arteriovenous fistula or  
76 graft improved quality of life scores for those receiving hemodialysis. Policies should be  
77 implemented to achieve an acceptable quality of life for all patients receiving renal replacement  
78 therapy.

79

80 **Keywords:** *Renal transplant, peritoneal dialysis, hemodialysis, EQ-5D-3L, KDQOL-36*

81

82

83

84

85

86

87

88

89

90

91

92

93 **Plain Language Summary**

94

95           We study the quality of life of patients receiving hemodialysis, peritoneal dialysis and those  
96 with renal transplants in the twin island of Trinidad and Tobago. Approximately half of the patients  
97 are of Indo-Trinbagonian origin. Almost two-thirds of persons have type 2 diabetes mellitus in the  
98 dialysis group. Data using quality of life questionnaires from 530 patients (100 renal transplants, 80  
99 peritoneal dialysis, 350 hemodialysis) show that renal transplant patients have the best quality of  
100 life. Patients on peritoneal dialysis also have a good quality of life. Among patients on  
101 hemodialysis, those with an arteriovenous fistula/graft perform better in the questionnaires than  
102 those with permanent catheters. Allowing patients greater access to these resources for renal  
103 replacement therapy will impact immensely on health status. This study is the first in the Caribbean  
104 to assess quality of life of patients on therapies for end stage renal disease. The findings can  
105 influence future decision and policy making in Latin America, the Caribbean and low income  
106 countries.

107

108

109

110

111

112

113

114

115

116

## 117 **Introduction**

118

119           The measurement of quality of life in patients with chronic disease is a complex entity that  
120 encompasses state of health, impact of disease, emotional factors and social support. Chronic  
121 kidney disease with its associated comorbidities and complications is a great challenge for  
122 physicians, patients and caregivers. Renal replacement therapy for end stage renal disease  
123 includes hemodialysis, peritoneal dialysis and renal transplantation. Patients with an improved  
124 quality of life have better treatment outcomes and decreased morbidity and mortality.<sup>1-6</sup> This study  
125 is the first in the Caribbean to evaluate the quality of life and health state associated with renal  
126 replacement therapy. In other settings, the determinants of quality of life of patients on renal  
127 replacement therapy are different.<sup>7-15</sup> This study will provide West Indian data in a developing  
128 country that can be used for policy determination in the Caribbean and low resource populations  
129 across the globe.

130           An earlier small study in Trinidad had shown that 18 % of asymptomatic patients had  
131 evidence for stage 3 chronic kidney disease.<sup>16</sup> Data from the Caribbean showed that diabetes and  
132 hypertension were the major contributors to this burden.<sup>17</sup> Of the modalities of renal replacement,  
133 renal transplantations offer the best survival, with survival rates in Trinidad of 91.46% (Standard  
134 Error 0.04), 89.51% (Standard Error 0.04) and 86.31% (Standard Error 0.05) for 1 year, 2 years  
135 and 3 years respectively.<sup>18</sup> However, the decision and choice of modality of renal replacement  
136 therapy are influenced by multiple factors. In Trinidad and Tobago, government funding for  
137 hemodialysis is dependent on a patient's present economic circumstances, which is assessed by  
138 the state. On the other hand, peritoneal dialysis is offered to all patients once they are deemed  
139 suitable for this therapy. The attending nephrologist determines referrals to the renal  
140 transplantation unit and criteria must be fulfilled to be considered for transplantation.

141           The aim of this study is to investigate patients on renal replacement therapy with a good  
142 quality of life to allocate resources in the future and to identify factors attributing to a better quality

143 of life and health status. Findings will also aid physicians in guiding choices of therapy tailored to  
144 individual circumstances and educate patients in their decision making when considering modality  
145 of renal replacement therapy.

146

147

148

149

150

151

152

153

154

155

156

157

158

159

160

161

162

163

164

165

166

167

168

## 169 **Materials and methods**

170

### 171 ***Study description***

172 This was a cross sectional study that sampled patients on all forms of renal replacement  
173 therapy in Trinidad and Tobago. The survey period ran for just over 1 year from the 1<sup>st</sup> October  
174 2015 to the 31<sup>st</sup> October 2016. Quality of life and health status was measured with established  
175 questionnaires and factors contributing to a high quality of life were determined.

176 Patients receiving renal replacement therapy in Trinidad and Tobago start dialysis or  
177 receive a renal transplant (T). Dialysis options include peritoneal dialysis (PD) and hemodialysis  
178 (HD). The government of Trinidad and Tobago funds this service. Hemodialysis and peritoneal  
179 dialysis are offered at the public health facilities with no user fees. Due to insufficient public  
180 facilities to cater for the number of patients requiring hemodialysis, the Ministry of Health through  
181 an external patient programme funds most patients that qualify (based on patient's socioeconomic  
182 status) at privately operated hemodialysis centres. Overall, whether a patient obtains this treatment  
183 in a public or private hemodialysis centre, the government ultimately provides this service for the  
184 vast majority. Potential transplant recipients access the central totally government-funded  
185 transplant unit via referrals from specialist nephrologists and such candidates are considered for  
186 living or deceased donor transplantations.

### 187 ***Inclusion and exclusion criteria***

188 The inclusion criteria were being a kidney transplant recipient or receiving dialysis for 3  
189 months or more and being at least 18 years of age. Studies had shown that this period is essential  
190 for adaptation to activities of daily living and return to regular functioning.<sup>6, 9-10</sup>

191 The exclusion criteria were being on renal replacement therapy for less than 3 months and  
192 being less than 18 years of age. Furthermore, persons hospitalized within 4 weeks from  
193 administration of the questionnaires were excluded from this study in keeping with the

194 recommendation of the developers of the KDQOL (Kidney Disease Quality of Life) instrument used  
195 to obtain data to assess quality of life.

## 196 **Sample size**

197 Since there is no formula or tables for determining or choosing sample sizes for non-  
198 random samples, the formula for computing sample sizes for simple random samples with  
199 replacement from finite populations was used to determine the number of participants that would  
200 be needed for the study, namely,

201

202

$$n = \frac{NZ_{\frac{0.05}{2}}^2 p(1-p)}{(N-1)d^2 + Z_{\frac{0.05}{2}}^2 p(1-p)}$$

203

204 In this formula  $N = 1383$  (T112, PD 87, HD 1184) was the approximate number of patients  
205 on renal replacement therapy in Trinidad and Tobago at the time of the study,  $Z_{\frac{0.05}{2}} = 1.96$ , is the  
206 standard normal distribution two-tailed 5% value and  $d = 0.05$  is the margin of error of the estimate  
207 of the population proportion of patients with a good quality of life. The minimum required sample  
208 size was calculated as  $n=546$  at the start of the study. At the end of data collection, 530 patients  
209 were studied constituting the following: 100 transplant patients, 80 peritoneal dialysis patients, 264  
210 private hemodialysis patients and 86 public hemodialysis patient.

211 All peritoneal dialysis and renal transplant patients meeting inclusion criteria were invited to  
212 participate at the beginning of the study period. Data was collected throughout the duration of this  
213 period. Convenience sampling was used to select hemodialysis participants from both public and  
214 private institutions during the duration of the study. Stratified random sampling was done among  
215 16 private facilities for hemodialysis. (Figure1) Geographical locations using distributions within  
216 health authorities were used to obtain ratios for stratified random sampling. These were the North  
217 Central, North West, and South West regional health authorities. These private facilities were

218 distributed in a 1:1:2 ratio respectively. The 16 private hemodialysis centres were located within  
219 these regional health authorities. Thirteen hemodialysis centres that included all the public centres  
220 and 8 private centres were studied. There were no private centres during the time of this study  
221 within the Eastern regional health authority and Tobago regional health authority.

## 222 **Questionnaires**

223 The International Standard Classification of Occupations of the United Nations<sup>19</sup>, the World  
224 Health Organization Global Database on Body Mass Index<sup>20</sup> and the International Statistical  
225 Classification of Diseases and Related Health Problems 10<sup>th</sup> Revision<sup>21</sup> were used to classify  
226 occupation, body mass index and diseases respectively in the demographics questionnaire. The  
227 demographics questionnaire also included information from participants on age, gender, ethnicity,  
228 comorbidities, aetiology of kidney disease, mode of renal replacement therapy, access type for  
229 hemodialysis, income bracket, employment status, smoking and alcohol consumption. For the  
230 obese category, persons of Asian (25kg/m<sup>2</sup>) and Afro-Caribbean descents (27kg/m<sup>2</sup>) were  
231 classified based on a prospective study that investigated ethnic groups.<sup>22</sup> Charlson's Comorbidity  
232 Index (CCI) estimates 10 year survival in patients with multiple comorbidities.<sup>23</sup> A higher score  
233 indicates a lower percentage estimated 10 year survival. CCI and mean quality of life scores were  
234 calculated.

235 The KDQOL-36 is a 36-item questionnaire that investigates quality of life. This was  
236 developed for patients with chronic renal disease and dialysis patients. It has been used for the  
237 evaluation of transplant patients and is valid and reliable in many populations.<sup>24-28</sup> The domain  
238 components include a physical component score (PCS), mental component score (MCS)  
239 symptoms and problems of kidney disease (SPKD), burden of kidney disease (BKD) and effect of  
240 kidney disease (EKD).

241 The EuroQol (EQ-5D-3L) self-reported health instrument was included. The EQ-5D-3L  
242 classification system has five domains: mobility, self-care, ability to perform usual activities,

243 pain/discomfort and anxiety/depression. Each dimension is scored from 1 to 3 with 1 representing ‘  
244 no problems’, 2 representing ‘moderate problems’, and 3 representing ‘extreme problems’. The  
245 EQ-5D-3L self-reported health instrument also includes a visual analogue scale (VAS) on which a  
246 respondent provides their self-assessed health rating from 0 (worst health imaginable) to 100 (best  
247 health imaginable). The EQ-5D-3L value set for Trinidad and Tobago was used to determine utility  
248 values for patients on all modalities of renal replacement therapy.<sup>29</sup> Trinidad and Tobago EQ-5D-3L  
249 population norms from a forthcoming study were used to compare EQ-5D-3L results for the  
250 patients on renal replacement therapy.

251 Transplant recipients were further analysed with the Kidney Transplant Questionnaire  
252 (KTQ). The KTQ is a quality of life instrument designed for transplant patients. The responses were  
253 analysed with a 7-point Likert scale where patients with a better quality of life had higher scores.<sup>10</sup>  
254 This questionnaire is valid and reliable in other populations.<sup>9, 30</sup> It is a reliable questionnaire in  
255 Trinidad and Tobago and will be validated in an upcoming study.

#### 256 **Data collection and informed consent**

257 Preparation for fieldwork included piloting and editing the questionnaire, creating a field  
258 manual to guide for the data collection process and a coding dictionary to facilitate data to be used  
259 for data coding (qualitative data) prior to data entry. Specific recommendations by the developers  
260 of all questionnaires were strictly followed. Prospective data collectors were trained in the use of  
261 the field manual. Data was regularly tested for high inter-collector reliability (Cohen’s kappa) and  
262 high agreement with a gold standard. All patients in this study provided informed consent in writing.  
263 Participants were thoroughly counselled on the nature and undertakings of the research. They  
264 were also advised that they could refuse to participate in the study or refuse to continue further in  
265 the questionnaire. Questionnaires were administered in an interview-based format and  
266 confidentiality was maintained. Hemodialysis patients were interviewed at their respective centres  
267 in a clinic setting using a consultation room with full privacy. Patients were approached after their  
268 hemodialysis session and those granting written consent and meeting inclusion criteria were  
269 administered the questionnaires. Renal transplant and peritoneal dialysis recipients were also

270 interviewed in a similar manner at the organ transplant unit and renal clinics respectively. Patients  
271 were encouraged to answer truthfully and there was no prompting of responses by interviewers  
272 who were trained in the administration of all questionnaires.

### 273 ***Ethical approval***

274 All permissions were obtained for public and private institutions. The ethics committees from  
275 the corresponding regional health authorities: North Central, North West, South West, Eastern and  
276 Tobago gave their approvals. The University of the West Indies ethics committee granted approval  
277 for this research.

### 278 ***Data Entry and Analysis***

279 The statistics software Statistical Package for the Social Sciences (SPSS) version 24 and  
280 Microsoft EXCEL was used for data entry and editing prior to data analysis. Preliminary  
281 computations included calculating a CCI for each patient. This index categorizes patients according  
282 to their probability of surviving different diseases during the 10-year period subsequent to the date  
283 on which the index was computed.<sup>23</sup> The lower the index the greater the probability of survival.

284 Subsequently SPSS version 24, MINITAB version 18 and STATA version 14 were used for  
285 both descriptive and inferential data analysis. Descriptive methods included frequency and  
286 percentage distribution tables and summary statistics. Inferential methods included 95%  
287 confidence intervals and analysis of variance. Tukey range tests and robust test of means of total  
288 and domain scores of the KDQOL-36 were done. Pairwise multiple comparisons for subgroups and  
289 domain scores were performed. Pearson's bivariate correlation for the PCS and MCS components  
290 and KTQ scores were done. Ordinary least squares regression model was done for the EQ-5D-3L  
291 questionnaire with corrections for age and gender among patients on different modalities of renal  
292 replacement therapy. Chi squared analysis was used to investigate CCI and significant

293 associations. The reliability of the KDQOL-36 questionnaire and the KTQ in this population was  
294 tested with Cronbach's alpha.

295

296

297

298

299

300

301

302

303

304

305

306

307

308

309

310

311

## 312 Results

### 313 *Baseline characteristics*

314 Figure 2 shows individuals at each stage of the study. The overall response rate was  
315 95.8%. The 16 patients who declined to participate were on hemodialysis. The proportion of  
316 patients on hemodialysis who self-funded their therapy is shown in table 1. In the dialysis group,  
317 most patients were in the 56-65 years age group. Reliability of the KDQOL-36 and KTQ  
318 instruments (Cronbach's alpha) were 0.988 and 0.999 respectively.

319 Table 2 gives the frequency and percentage distribution of selected characteristics of the  
320 patients. As seen they were predominantly male (52.5%) and of Indo-Trinbagonian descent  
321 (51.5%). Patients were mostly of the 55-65 years of age category (37.5%).

322 Chi-square analysis showed that CCI (and by association 10-year survival probability) was  
323 associated with sex ( $\chi^2 = 8.66$ ,  $p = 0.013$ ), age ( $\chi^2 = 43.6$ ;  $p \leq 0.001$ ), ethnicity ( $\chi^2 = 339.7$ ;  $p \leq$   
324  $0.001$ ); and type of renal replacement ( $\chi^2 = 66.7$ ;  $p \leq 0.001$ ).

325

326 Table 1: Source of funding for patients on hemodialysis

Source of funding	Mode of therapy	
	Hemodialysis (H=350)	
	Private centre patients	Public centre patients
Government funded	252	86
Self-funded	12	0

327

328

329 Table 2: Characteristics of patients on renal replacement therapy

330

<b>Characteristic</b>	<b>All modalities/ Percent (%) patients N=530</b>	<b>Hemodialysis/ Percent (%) patients H=350</b>	<b>Peritoneal Dialysis/ Percent (%) patients P=80</b>	<b>Renal Transplant/ Percent (%) patients T=100</b>
<b>Sex</b>				
<b>Male</b>	52.50	52.30	46.30	58.00
<b>Female</b>	47.50	47.70	53.70	42.00
<b>Ethnicity</b>				
<b>Indo Trinidadian</b>	51.30	52.50	53.50	58.00
<b>Afro Trinidadian</b>	37.50	38.50	36.50	32.00
<b>Mixed</b>	10.00	7.50	9.00	9.00
<b>Other</b>	1.20	1.50	1.00	1.00
<b>Income/month</b>				
<b>≤ \$1000 TT</b>	46.98	58.51	32.50	27.00
<b>&gt; \$1000 TT, ≤ \$4000 TT</b>	12.83	15.37	11.25	1.00
<b>&gt; \$4000 TT, ≤ \$8000 TT</b>	30.57	24.51	37.50	42.00
<b>&gt; \$8000TT, ≤ 12000 TT</b>	8.68	1.77	18.75	25.00
<b>&gt; 12000TT</b>	0.94	0.00	0.00	5.00
<b>Occupation</b>				
<b>Managers</b>	4.15	2.57	1.25	12.00
<b>Professionals</b>	7.92	2.85	11.25	23.00
<b>Technicians and associate professionals</b>	1.70	0.29	1.25	7.00
<b>Clerical support workers</b>	3.40	1.43	6.25	8.00
<b>Service and sales workers</b>	7.55	8.57	6.25	5.00
<b>Service and sales workers</b>	0.38	0.28	0.00	1.00

<b>Skilled agricultural forestry and fishery workers</b>	4.91	2.00	6.25	14.00
<b>Craft and related trade worker</b>	3.58	1.71	13.75	2.00
<b>Plant and machine operators and assemblers</b>	4.71	5.70	0.00	5.00
<b>Elementary occupations</b>	0.57	0.28	1.25	1.00
<b>Armed forces occupation</b>				
<b>Employment</b>				
<b>Not employed or pursuing educational goals</b>	43.77	54.00	22.50	11.00
<b>Employed</b>	33.96	22.86	43.75	65.00
<b>Pursuing educational goals</b>	12.08	14.29	13.75	14.00
<b>Retired</b>	10.57	16.00	20.00	10.00
<b>Prior form of Renal Replacement Therapy(not in an acute setting)</b>				
<b>Not on any form of renal replacement therapy before</b>	81.90	98.57	78.75	20.00
<b>Hemodialysis</b>	16.22	Not applicable	17.50	76.00
<b>Peritoneal Dialysis</b>	0.56	0.00	Not applicable	4.00
<b>Renal Transplant</b>	1.32	1.43	3.75	Not applicable

331

332

333

334

335 Underweight patients were predominantly on peritoneal dialysis and the prevalence of  
336 obesity was greater among hemodialysis patients (Figure 4). The self-reported cause of chronic  
337 kidney disease is seen in figure 5. In 84% of persons, the diagnosis of chronic kidney disease was  
338 made when patients required renal replacement therapy.

339 Thirty three percent of patients on hemodialysis had an arteriovenous fistula or graft  
340 (AVF/G) as their primary access type. Almost half of the patients with permanent catheters were  
341 managed for catheter related blood stream infections within the last 5 years of the study period.  
342 Infective endocarditis was reported in 15% of those patients within the last 5 years of the study  
343 period. With respect to comorbidities, all patients with a CCI  $\geq 6$  were on hemodialysis. No  
344 transplant or peritoneal dialysis patients had a CCI  $\geq 6$ . These patients constituted 15% of the total  
345 number of patients on hemodialysis.

### 346 ***Results of Analysis of Variance (ANOVA) and pairwise*** 347 ***comparisons***

348 The KDQOL total and domain scores were scaled to 100. Table 3 shows mean and  
349 standard deviation of PCS, MCS, SPKD, BKD, EKD, and total KDQOL by demographic categories  
350 (age, ethnicity), CCI, income, employment status and mode of renal therapy.

351 Even though no trends or patterns could be discerned among the means, analysis of  
352 variance showed that there were statistically significant differences between the mean scores  
353 among the ethnic groups, among patients on different modalities, among patients with different  
354 CCI, income brackets and employment status. Table 3 shows pairwise comparisons where cell  
355 values with different lettering indicate significant differences with the group and where numbers  
356 with the same lettering indicate no statistically significant difference.

357 Table 4 shows analysis of variance for KDQOL scores and mode of renal replacement  
358 therapy. Analysis of variance methods show statistically significant quality of life scores among

359 hemodialysis patients and type of access. Table 5 also shows pairwise comparisons of statistically  
360 significant differences (different lettering) versus no differences (same lettering) in quality of life  
361 among hemodialysis patients and type of access used.

362

363

364

365

366

367

368

369

370

371

372

373

374

375

376

377

378

379

380

381

382

383

384

385

386

387

388

389  
390

Table 3: Pairwise multiple comparisons for KDQOL scores

Variable	Measure	PCS	MCS	SPKD	BKD	EKD	Total Score
<b>Age</b>	<b>p value</b>	<b>0.744</b>	<b>0.555</b>	<b>0.360</b>	<b>0.533</b>	<b>0.977</b>	<b>0.695</b>
<b>18-25</b>	Mean	77.00	76.52	81.33	65.63	82.00	78.68
	Std. Deviation	23.2	17.65	21.23	26.19	21.95	18.74
<b>26-35</b>	Mean	68.50	76.08	75.16	66.25	73.75	73.14
	Std. Deviation	27.35	25.26	30.48	31.69	27.90	27.30
<b>36-45</b>	Mean	73.50	76.95	78.67	68.13	73.25	75.28
	Std. Deviation	26.80	23.43	26.90	30.18	28.55	24.90
<b>46-55</b>	Mean	66.50	75.65	71.17	68.13	71.00	70.63
	Std. Deviation	28.30	22.65	31.72	30.63	31.38	28.29
<b>56-65</b>	Mean	56.00	66.09	57.50	68.13	57.00	57.98
	Std. Deviation	25.30	22.39	30.26	25.75	28.50	25.87
<b>66-75</b>	Mean	64.30	75.65	67.17	68.13	66.50	67.11
	Std. Deviation	27.85	22.00	30.43	28.31	28.98	26.45
<b>&gt;75</b>	Mean	71.00	75.65	96.33	68.13	99.00	87.55
	Std. Deviation	22.45	19.83	4.15	37.63	2.23	7.96
<b>Mode Of Therapy</b>	<b>p value</b>	<b>≤0.001</b>	<b>≤0.001</b>	<b>≤0.001</b>	<b>≤0.001</b>	<b>≤0.001</b>	<b>≤0.001</b>
<b>Hemodialysis</b>	Mean	51.50 <u>a</u>	62.96 <u>a</u>	53.43 <u>a</u>	47.69 <u>a</u>	52.90 <u>a</u>	53.87 <u>a</u>
	Std. Deviation	22.30	21.26	28.37	23.06	26.89	23.47
<b>Peritoneal Dialysis</b>	Mean	75.00 <u>b</u>	82.17 <u>b</u>	92.52 <u>b</u>	70.19 <u>b</u>	87.28 <u>b</u>	85.26 <u>b</u>
	Std. Deviation	21.95	15.57	9.38	24.25	12.35	10.61
<b>Renal Transplant</b>	Mean	98.10 <u>c</u>	96.70 <u>c</u>	98.10 <u>c</u>	98.25 <u>c</u>	98.80 <u>c</u>	98.10 <u>c</u>
	Std. Deviation	4.70	7.70	4.80	5.56	3.43	4.20

<b>Charlson's Comorbidity Index</b>	<b>p value</b>	0.489	0.272	<b>0.023</b>	0.144	<b>0.006</b>	<b>0.030</b>
<b>2</b>	Mean	77.05	79.87	82.98 <u>a</u>	73.38	80.92 <u>a</u>	80.31 <u>a</u>
	Std. Deviation	25.30	21.30	24.78	27.83	25.25	23.18
<b>3</b>	Mean	67.15	75.78	72.83 <u>a</u>	58.63	72.10 <u>a</u>	71.23 <u>a</u>
	Std. Deviation	26.15	23.08	29.73	30.00	28.85	25.85
<b>4</b>	Mean	61.15	70.57	66.13 <u>b</u>	62.25	65.30 <u>b</u>	68.54 <u>b</u>
	Std. Deviation	27.85	23.60	31.52	28.44	30.53	28.01
<b>5</b>	Mean	56.45	66.70	56.80 <u>b</u>	51.56	56.20 <u>b</u>	57.52 <u>b</u>
	Std. Deviation	24.65	22.70	30.50	26.06	28.20	25.56
<b>≥6</b>	Mean	41.61	64.58	50.67 <u>b</u>	47.08	50.75 <u>b</u>	50.58 <u>b</u>
	Std. Deviation	25.24	16.63	28.75	19.95	33.42	24.56
<b>Ethnicity</b>							
<b>Ethnicity</b>	<b>p value</b>	<b>0.034</b>	<b>0.045</b>	<b>0.023</b>	<b>0.036</b>	<b>0.016</b>	<b>0.012</b>
<b>Indo-Trinbagonian</b>	Mean	61.00 <u>a</u>	69.57 <u>a</u>	63.16 <u>a</u>	59.38 <u>a</u>	62.25 <u>a</u>	63.21 <u>a</u>
	Std. Deviation	28.60	24.30	31.45	29.50	29.83	27.96
<b>Afro-Trinbagonian</b>	Mean	66.50 <u>a</u>	74.78 <u>a</u>	72.17 <u>a</u>	62.50 <u>a</u>	71.00 <u>a</u>	70.63 <u>a</u>
	Std. Deviation	25.15	21.78	29.23	28.06	29.48	25.69
<b>Mixed</b>	Mean	65.00 <u>a</u>	73.47 <u>a</u>	72.33 <u>a</u>	58.75 <u>a</u>	70.50 <u>a</u>	69.69 <u>a</u>
	Std. Deviation	26.55	20.13	30.57	28.38	28.00	24.88
<b>Other</b>	Mean	98.00 <u>b</u>	100.00 <u>b</u>	100.00 <u>b</u>	100.00 <u>b</u>	100.00 <u>b</u>	99.37 <u>b</u>
	Std. Deviation	4.70	0.00	0.00	0.00	0.00	3.50
<b>Income Bracket</b>							
<b>Income Bracket</b>	<b>p value</b>	<b>0.017</b>	<b>0.024</b>	<b>0.019</b>	<b>0.020</b>	<b>0.023</b>	<b>0.019</b>
<b>≤ \$1000 TT</b>	Mean	56.48 <u>a</u>	57.55 <u>a</u>	56.63 <u>a</u>	52.73 <u>a</u>	58.14 <u>a</u>	55.66 <u>a</u>
	Std. Deviation	16.75	19.31	16.84	20.63	15.37	17.01
<b>&gt; \$1000 TT, ≤ \$4000 TT</b>	Mean	60.44 <u>a</u>	65.36 <u>a</u>	67.45 <u>a</u>	63.42 <u>a</u>	65.69 <u>a</u>	61.80 <u>a</u>
	Std. Deviation	13.91	19.22	17.58	21.55	19.46	21.56
<b>&gt; \$4000 TT,</b>	Mean	73.27 <u>b</u>	76.82 <u>b</u>	77.58 <u>b</u>	70.73 <u>b</u>	78.32 <u>b</u>	75.09 <u>b</u>

<b>≤ \$8000 TT</b>	Std. Deviation	16.63	19.37	18.76	19.31	17.28	20.12
<b>&gt; \$8000TT, ≤ 12000 TT</b>	Mean	86.59 <u>b</u>	80.50 <u>b</u>	86.75 <u>b</u>	79.59 <u>b</u>	91.73 <u>b</u>	89.92 <u>b</u>
	Std. Deviation	19.48	16.72	19.43	18.13	15.54	12.23
<b>&gt; 12000TT</b>	Mean	86.28 <u>b</u>	92.55 <u>b</u>	90.30 <u>b</u>	80.61 <u>b</u>	88.46 <u>b</u>	87.79 <u>b</u>
	Std. Deviation	18.46	16.50	15.43	16.32	12.38	10.77
<b>Employment Status</b>							
	<b>p value</b>	<b>0.013</b>	<b>0.022</b>	<b>0.034</b>	<b>0.026</b>	<b>0.015</b>	<b>0.018</b>
<b>Unemployed</b>	Mean	56.58 <u>a</u>	58.94 <u>a</u>	56.36 <u>a</u>	51.38 <u>a</u>	60.18 <u>a</u>	54.50 <u>a</u>
	Std. Deviation	21.53	22.16	24.18	24.33	26.36	23.97
<b>Employed</b>	Mean	88.76 <u>b</u>	80.20 <u>b</u>	82.63 <u>b</u>	75.56 <u>b</u>	89.64 <u>b</u>	82.38 <u>b</u>
	Std. Deviation	23.65	21.57	23.78	26.24	23.47	22.43
<b>Educational /Vocational</b>	Mean	69.80 <u>c</u>	70.48 <u>c</u>	68.94 <u>c</u>	67.82 <u>c</u>	71.63 <u>c</u>	69.73 <u>c</u>
	Std. Deviation	25.78	23.42	24.66	23.47	23.55	26.98
<b>Retired</b>	Mean	82.65 <u>b</u>	78.64 <u>b</u>	80.56 <u>b</u>	73.40 <u>b</u>	87.35 <u>b</u>	77.11 <u>b</u>
	Std. Deviation	24.36	26.32	25.38	25.28	23.70	22.89

391

392  
393  
394  
395  
396  
397  
398  
399  
400  
401  
402  
403  
404  
405  
406  
407  
408  
409  
410  
411  
412  
413

414 Table 4: Analysis of Variance (PCS, MCS, BKD, SPKD, EKD, Total KDQOL score)  
 415  
 416  
 417

Dependent Variable		Sum of Squares	df	Mean Square	F	p
<b>PCS</b>	Mode of renal replacement	2044.44	3	681.48	48.10	≤ 0.001
<b>MCS</b>	Mode of renal replacement	2104.72	3	701.58	38.71	≤ 0.001
<b>BKD</b>	Mode of renal replacement	2217.44	3	739.15	100.53	≤ 0.001
<b>SPKD</b>	Mode of renal replacement	43102.58	3	14367.53	85.61	≤ 0.001
<b>EKD</b>	Mode of renal replacement	17077.04	3	5692.35	84.62	≤ 0.001
<b>TOTAL</b>	Mode of renal replacement	226222.19	3	75407.40	100.53	≤ 0.001

418  
 419  
 420  
 421

Table 5: Pairwise multi-comparison for patients on hemodialysis and primary access type

422

Access Type	Measure	PCS	MCS	SPKD	BKD	EKD	Total
	<b>p value</b>	<b>≤ 0.001</b>					
<b>Av Fistula N=108</b>	Mean	65.40 <u>a</u>	78.57 <u>a</u>	79.65 <u>a</u>	69.56 <u>a</u>	77.58 <u>a</u>	76.62 <u>a</u>
	Std. Deviation	16.10	15.96	23.67	20.25	24.58	19.23
<b>Av Graft N=9</b>	Mean	57.20 <u>a</u>	68.13 <u>a</u>	76.48 <u>a</u>	73.63 <u>a</u>	77.23 <u>a</u>	73.16 <u>a</u>
	Std. Deviation	11.75	15.65	30.27	33.75	28.73	25.07
<b>Permanent Catheter N=229</b>	Mean	42.10 <u>b</u>	55.74 <u>b</u>	40.68 <u>b</u>	36.63 <u>b</u>	40.68 <u>b</u>	42.77 <u>b</u>
	Std. Deviation	17.80	19.74	20.30	14.25	18.00	15.94
<b>Other N=4</b>	Mean	32.50 <u>b</u>	45.65 <u>b</u>	23.75 <u>b</u>	26.25 <u>b</u>	33.75 <u>b</u>	31.45 <u>b</u>
	Std. Deviation	8.65	12.52	3.43	7.88	10.10	6.59

423

424 ***Transplant patients and the KTQ***

425 The KTQ uses a 7-point Likert scale where higher scores indicate a better quality of life.  
 426 Table 6 shows the mean, standard deviation, 95% CI (confidence interval) and percentage of  
 427 patients attaining maximum scores for the KTQ subscales. The results show that the quality of life  
 428 among them was high for each of the five subscales. Ceiling effects were seen for the transplant  
 429 patients and the KTQ subscales. Table 7 shows the Pearson’s bivariate correlation among the  
 430 variables in table 6 and the PCS and MCS components of the KDQOL-36. PCS and MCS were all  
 431 positively correlated with each of the KTQ components ( $p \leq 0.001$ ).

432 Table 6: KTQ subscale scores

Measure	Dependent Variable				
	Physical	Fatigue	Uncertainty	Appearance	Emotional
<b>n</b>	100	100	100	100	100
<b>Mean</b>	6.50	6.86	6.09	6.91	6.85
<b>Std. Deviation</b>	1.193	0.450	0.621	0.351	0.458
<b>95% CI</b>	(6.3, 6.7)	(6.8, 7.0)	(5.8, 6.2)	(6.8, 7.0)	(6.8, 7.0)
<b>%Patients with maximum score</b>	82	74	79	85	70

433  
 434  
 435  
 436  
 437

438 Table 7: Pearson's bivariate correlation coefficients and p-values

KDQOL		KTQ				
		Physical	Fatigue	Uncertainty	Appearance	Emotional
<b>PCS</b>	r	0.596	0.606	0.603	0.606	0.606
	p value	≤ 0.001	≤ 0.001	≤ 0.001	≤ 0.001	≤ 0.001
<b>MCS</b>	r	0.509	0.516	0.515	0.514	0.507
	p value	≤ 0.001	≤ 0.001	≤ 0.001	≤ 0.001	≤ 0.001

439

440 ***EQ-5D-3L results***

441 The mean VAS and mean index values seen in table 8 were best among the transplant  
 442 group followed by peritoneal dialysis then hemodialysis (p=0.000). Table 9 shows that transplant  
 443 patients perform better than hemodialysis patients based on both the EQ-VAS and index values.  
 444 Additional file 1, supplementary table 1 shows the EQ-5D-3L health states that were observed for  
 445 the 3 groups in this study. Four EQ-5D-3L states were observed among transplant patients. Ninety  
 446 five percent of the transplant recipients were in the full health state (11111). None of the transplant  
 447 recipients reported level three on any of the EQ-5D-3L dimensions. In comparison to population  
 448 norms for age and gender in Trinidad and Tobago, the health state profile for transplant patients  
 449 was better than the normal population. Table 8 shows the EQ-VAS and index values for the three  
 450 groups. On both measures, the transplant group had the highest values and the hemodialysis  
 451 group had the lowest values.

452

453

454 Table 8: Mean VAS and index values using EQ-5D-3L for patients on renal replacement

Measures	Mode of Therapy		
	Hemodialysis	Peritoneal Dialysis	Transplant
<b>Mean VAS</b>	62.00	79.13	88.25
<b>Std Error</b>	0.74	1.46	1.19
<b>95% Confidence Interval</b>	60.54-63.46	76.26-81.99	85.90-90.60
<b>Mean Index</b>	0.78	0.90	0.99
<b>Std Error</b>	0.01	0.02	0.00
<b>95% Confidence Interval</b>	0.76-0.80	0.87-0.93	0.99-0.99

455 VAS: Visual Analogue Scale

456

457 Table 9 shows the results of ordinary least squares regression model for EQ-VAS and EQ-  
 458 5D-3L index values with controls for age and gender. Transplant is used as the reference category  
 459 with dummy variables for peritoneal dialysis and hemodialysis. The coefficients for peritoneal  
 460 dialysis and hemodialysis in these models are -8.63,-25.74 and -0.08, -0.20 for EQ-VAS and EQ-  
 461 5D-3L respectively. These coefficients indicate the size of the differences between transplant and  
 462 the other two modalities. Peritoneal dialysis is associated with a reduction of 8.63 VAS points, and  
 463 a reduction of 0.08 in utility when compared with transplant recipients. Hemodialysis carries  
 464 decrements of 25.74 VAS points and 0.20 in utility when compared to the transplant group.

465

466

467

468 Table 9: Visual analogue scale and index values using ordinary least squares regression and  
 469 robust standard errors of transplant recipients compared to patients on hemodialysis and peritoneal  
 470 dialysis

471

<b>VAS</b>	Coefficient	Standard Error	P>t	95% Confidence Interval	
				Lower	Upper
Age	-0.53	0.43	0.22	-1.36	0.31
Gender	-0.41	1.17	0.73	-2.71	1.89
PD	-8.63	2.05	0.00	-12.66	-4.59
HD	-25.74	1.58	0.00	-28.84	-22.65
Constant	90.61	2.60	0.00	85.51	95.7
<b>Index</b>	Coefficient	Standard Error	P>t	95% Confidence Interval	
				Lower	Upper
Age	-0.01	0.00	0.01	-0.02	-0.00
Gender	-0.00	0.01	0.93	-0.03	0.02
PD	-0.08	0.02	0.00	-0.13	-0.04
HD	-0.20	0.02	0.00	-0.24	-0.17
Constant	1.04	0.03	0.00	0.97	1.09

472 PD-Peritoneal dialysis, HD-Hemodialysis

473

474

475

476

477

478

479

## 480 **Discussion**

### 481 ***Overview***

482                   The KDQOL-36 domain scores and significantly associated variables included  
483 modality of renal replacement, Charlson's Comorbidity Index, ethnicity, income and employment  
484 status. Transplant patients performed the best in the KDQOL-36 and EQ-5D-3L. Patients on  
485 peritoneal dialysis had a better quality of life than hemodialysis patients. Among patients on  
486 hemodialysis, an arteriovenous fistula or graft significantly impacted on quality of life.

487                   Quality of life is a difficult and complex construct to measure that involves the interplay of  
488 numerous factors and extends into all aspects of an individual's functioning. Wilson and Cleary  
489 provide a model that starts at a cellular level and progresses to the individual interacting with  
490 society.<sup>31</sup> Quality of life not only encompasses genetics and the environment but also includes  
491 social, cultural, economic and psychological measurements. In assessing the success of therapy,  
492 quality of life and state of health has been used throughout the years as indicators of treatment  
493 outcome and subsequently can be employed to evaluate the cost effectiveness of therapies.

494                   In this population, about 90% of patients on renal replacement are on dialysis and two  
495 thirds of the hemodialysis patients have permanent catheters as their primary access type. These  
496 findings emphasize the importance of this study in a Caribbean population and the impact of the  
497 factors affecting quality of life. Robinson et al has shown differences in the patient population on  
498 renal replacement therapy across the continents.<sup>32</sup> Countries studied were Central and Eastern  
499 Europe, Eastern and South Eastern Asia and the United States of America. <sup>32</sup> In particular, it was  
500 seen that most of the patients in Japan on hemodialysis use an arteriovenous fistula. <sup>32</sup> Japan and  
501 Norway utilize renal transplantation as their main mode of renal replacement therapy while in  
502 Europe, less than 5% of patients with kidney disease are transplanted. <sup>32</sup>

503

504

505 ***Biological factors***

506 **Mode of renal replacement therapy**

507 In 1985, Evans and colleagues measured the quality of life of patients undergoing dialysis  
508 and transplantation. They found that 79.1% of transplant patients were able to function at nearly  
509 normal levels compared to between 47.5% and 59.1% of dialysis patients depending on the type of  
510 dialysis.<sup>33</sup> In this study it was found that patients who received renal transplants had better quality  
511 of life scores compared with dialysis patients.(Table 3) Peritoneal dialysis patients performed better  
512 than hemodialysis patients. Renal transplant patients also achieved higher scores in the disease  
513 specific domains of the KDQOL questionnaire than dialysis patients. In the hemodialysis and  
514 peritoneal dialysis groups, the burden of kidney disease was the greatest challenge for patients.  
515 (Table 3) In the transplant group, the mental domain subset had the lowest score compared to  
516 other domains of the KDQOL. The KTQ used for transplant patients further demonstrated that  
517 quality of life of transplant patients was high. In patients with end stage renal disease, the option of  
518 dialysis is still a great challenge for patients and physicians and institution of measures to improve  
519 quality of life for patients on peritoneal dialysis and hemodialysis is necessary. This study can  
520 guide decision makers with the potential solutions to assist with disease burden.

521 Some studies have shown that renal transplant recipients have better quality of life scores  
522 than patients on peritoneal dialysis and hemodialysis.<sup>1-2, 8, 14</sup> Other studies show diverse  
523 outcomes,<sup>10-11,13,15</sup> while some have not explored other factors besides mode of therapy that may  
524 attribute to a good quality of life.<sup>1-2,10-12,14</sup> A meta-analysis done on the quality of life of patients on  
525 renal replacement therapy concluded that hemodialysis and peritoneal dialysis patients tend to  
526 have an inferior quality of life when compared to transplant recipients.<sup>12</sup> Quality of life was worse  
527 for hemodialysis compared to peritoneal dialysis patients.<sup>2,12</sup> This was also found in this study.  
528 (Table 3) Peritoneal dialysis requires a patient to have good social support and adequate facilities  
529 in the home environment to perform the procedure on a daily basis. The medical social worker

530 plays an integral role in deciding candidacy. Health care workers also meticulously train patients  
531 and their families regularly.

532 In the EQ-5D-3L health state, transplant recipients actually performed better than the age  
533 and gender adjusted population norms for Trinidad and Tobago. Renal transplant recipients  
534 performed the best on the VAS and index values. Ninety five percent of transplant recipients were  
535 in state 11111, the best state of health. Additional file 2, supplementary figure 1 shows that  
536 transplant recipients reported less problems than the normal population. This finding can be  
537 investigated in a future study. The ordinary least squares model in table 9 shows that the health  
538 status of transplant patients is considerably better than that of peritoneal dialysis and hemodialysis  
539 patients. Ceteris paribus, moving a patient from hemodialysis to transplant can result in an increase  
540 in utility of 0.2 and over 25 VAS points, based on the population in this study. Similarly moving a  
541 patient from peritoneal dialysis to transplant will result in an increase in utility of 0.08 and 8.6 VAS  
542 points. The relative sizes of the PD and HD coefficients in table 9 also highlight the considerable  
543 difference in health status between peritoneal dialysis and hemodialysis. That is, hemodialysis  
544 represents a considerably larger health decrement than peritoneal dialysis for this group.

545 Renal transplant recipients were also maintained on their therapy for longer periods than  
546 persons on other forms of therapy. Using a period of 5 years on renal replacement therapy, 8% of  
547 patients were on hemodialysis while about one third of all transplant recipients had functioning  
548 grafts. These findings may be due to a number of reasons including comorbidities, age and type of  
549 access among this group. Renal transplantation when compared to other forms of renal  
550 replacement therapy is associated with fewer hospitalizations and death influencing the cost  
551 effectiveness of this modality around the world.<sup>34-35</sup>

552 Renal transplantation may be the most physiologically similar to one's body as a mode of  
553 renal replacement therapy. Among transplant recipients, immunologic similarity can further be  
554 assessed with haplotype match between donor and recipient. Transplantation is also the least time  
555 consuming method of all modalities. Hemodialysis patients have approximately 3 sessions of  
556 hemodialysis per week, while peritoneal dialysis patients undergo dialysis sessions at their home.

557 **Lifestyle diseases and comorbidities**

558 Lifestyle diseases among dialysis patients were the primary causes of kidney disease.  
559 Healthy lifestyle influences quality of life.<sup>36</sup> During this study, it was shown that among the dialysis  
560 patients the main causes of renal failure was type 2 diabetes mellitus or hypertension. However, in  
561 renal transplant patients, chronic glomerulonephritis was the main self-reported cause of chronic  
562 kidney disease. Over 80% of patients were diagnosed with kidney disease when renal replacement  
563 was necessary. This finding exposes the inadequacies of screening and the necessity for better  
564 strategies for preventing and treating lifestyle diseases in our setting.

565 Patients on hemodialysis also had more comorbidities than patients on other types of renal  
566 replacement. A CCI  $\geq 6$  equivalent to a 10-year survival probability of 0 was found only among the  
567 hemodialysis group. Patients with a CCI  $\leq 3$  had significantly better mean SPKD, EKD and total  
568 scores.

569

570 **AVF/G for hemodialysis**

571 Patients with an AVF/G performed better in all domains of the KDQOL-36 when compared  
572 to patients with permanent catheters. (Table 5) In the BKD subset, patients with an AVF/G had  
573 similar scores to those on peritoneal dialysis. It has been shown that this access type is not only  
574 cost efficient but offers a better quality of life for patients because of fewer complications than a  
575 permanent catheter.<sup>37, 38</sup> Policy guidelines and support networks can therefore be improved for  
576 prompt referral and early surgery for an AVF/G when choosing hemodialysis.

577 **Adiposity stores**

578 Increased adiposity may be favourable for patients on hemodialysis providing an anti-  
579 inflammatory benefit during times of cellular stress.<sup>39-43</sup> Studies have shown improved survival  
580 and a better quality of life of patients with a BMI  $>25$  on hemodialysis.<sup>41-43</sup>

581

## 582 **Age, gender and ethnicity**

583 Additional file 2, supplementary figure 1 for the EQ-5D-3L questionnaire shows that  
584 younger patients reported fewer problems in the hemodialysis group in both male and female. A  
585 similar trend is seen in the normal population where younger patients report fewer problems. A  
586 study that looked at patients on hemodialysis showed improved quality of life in younger patients.<sup>44</sup>  
587 Older female patients on peritoneal dialysis reported fewer problems than those in the younger age  
588 groups while the extremes of age among male peritoneal dialysis patients reported more problems.  
589 Male transplant recipients in the 18 to 24 years group and 45-54 years group reported more  
590 problems.

591 Patients falling into the category of “other” for ethnicity had significantly greater mean  
592 quality of life scores than the remaining patients. In this study, patients categorized into this group  
593 were either Chinese or Syrian descent. These patients constituted 1.2% of all persons on renal  
594 replacement therapy. (1%T, 1%PD, 1.5% HD)

## 595 ***Social factors***

### 596 **Employment**

597 Employment status significantly influenced quality of life. The majority of the employed  
598 population on renal replacement were transplant recipients followed by patients on peritoneal  
599 dialysis. (Table 3) It is possible that patients receiving transplants were able to take advantage of  
600 employment opportunities because of more time availability. Retired persons also had significantly  
601 better mean KDQOL scores than those pursuing educational goals or those that were unemployed.  
602 In Canada, in the first 2 years after renal replacement therapy, employment opportunities was the  
603 best in the transplant subset.<sup>10</sup> Table 2 also shows that in the occupation category of managers  
604 and professionals, transplant recipients formed the majority of these categories followed by  
605 patients on hemodialysis.  
606

## 607 **Economic status**

608 Like employment, income is another factor affecting quality of life of patients receiving  
609 renal replacement therapy. Alvares and colleagues also saw this in another study.<sup>8</sup> In this  
610 population, patients earning more than \$4000 Trinidad and Tobago dollars monthly (equivalent to  
611 approx. 600 US Dollars) had better mean quality of life scores.

## 612 ***Renal replacement therapy options***

613 Options for renal replacement therapy include renal transplantation, peritoneal dialysis and  
614 hemodialysis. Similar to worldwide health care systems, each mode of therapy has specific  
615 requirements and criteria before initiation, some being more rigorous than others.

616 Hemodialysis in our population is associated with the poorest quality of life and the most  
617 problems reported by patients using the KDQOL-36 and EQ5D-3L questionnaires. The 17 VAS  
618 points difference and 0.12 utility for patients on hemodialysis compared to peritoneal dialysis  
619 suggests that a transition to peritoneal dialysis can significantly affect health status.

620 Certain modes of renal replacement therapy in our setting is associated with multiple  
621 checkpoints and prerequisites that should be satisfied, greater engagement of patients and their  
622 families and better support systems. As a result, these modalities of therapy like renal  
623 transplantation and peritoneal dialysis may produce patients that are more likely to adhere to  
624 therapy and management of comorbidities. Table 10 demonstrates the requirements and factors  
625 implicated in this study for each modality of renal replacement therapy in our population.

626 The renal transplant recipients' main self-reported causes of kidney disease was chronic  
627 glomerulonephritis while dialysis patients reported type 2 diabetes and hypertension. Chi-square  
628 analysis showed that CCI (and by association 10-year survival probability) was associated with  
629 type of renal replacement ( $\chi^2 = 66.7$ ;  $p \leq 0.001$ ). There may be selectivity of patients for renal  
630 transplantation as a mode of renal replacement. Ceiling effects (present when > 15% of patients  
631 achieve the maximum possible score<sup>45</sup>) were seen for the transplant sub group with the EQ-5D-3L  
632 states and the KTQ subscales. Fifty nine percent of patients on peritoneal dialysis and 20% of

633 patients on hemodialysis achieved a state of 11111 in the EQ-5D-3L also demonstrating ceiling  
634 effects. The KDQOL-36 domain and total scores did not show ceiling effects among subgroups. In  
635 a Palestinian study of renal transplant patients, a substantial ceiling effect was present for the KTQ-  
636 appearance subscale, with 84% of renal transplant recipients receiving the highest possible score.  
637 <sup>46</sup> In a study of renal transplant patients in the United States, neither ceiling nor floor effects were  
638 noted for the PCS or MCS.<sup>47</sup> However in this same study there were modest ceiling effects for  
639 KTQ-physical, KTQ-fatigue, KTQ-uncertainty/fear, and KTQ-emotional subscales and a substantial  
640 ceiling effect was present for the KTQ-appearance subscale, with 84% of renal transplant  
641 recipients receiving the highest possible score. <sup>47</sup> In this study, in the KTQ-appearance and KTQ-  
642 physical symptoms subscales, 85% and 82% respectively of transplant patients obtained the  
643 maximum score.

644

645

646

647

648

649

650

651

652

653

654

655

656

657

658

659

660 Table 10: Factors implicated in the initiation of renal replacement therapy

661

<b>Factors implicated in therapy</b>	<b>Mode of therapy (chronic setting)</b>		
	Hemodialysis	Peritoneal dialysis	Renal transplant
<b>Government funding</b>	Yes	Yes	Yes
<b>Multidisciplinary approach</b>	Minimal	Minimal	Management of comorbidities by respective specialists
<b>Social support</b>	Medical social worker evaluates socioeconomic status to qualify for government funding	Multiple medical social worker evaluations	Multiple medical social worker evaluations and psychiatric evaluations
<b>Evaluation of home and surroundings</b>	Not required	Required as therapy is done at home	Not required
<b>Family integration</b>	Minimal- interaction with patient and hemodialysis nurses	Yes- adequate family meetings with social worker and peritoneal dialysis nurses	Yes-multiple family meetings with social worker and transplant unit
<b>Counselling on therapy</b>	Counselling by hemodialysis nurse	Counselling by peritoneal dialysis nurse	Educational lectures pre and post-transplant by transplant coordinators Counselling by multidisciplinary team

<b>Ethical assessment</b>	Not required	Not required	Required
<b>Minimal time interval to initiate therapy (state funded)</b>	1-3 months	3-6 months	6 months -1 year

662

## 663 ***Limitations***

664           The quality of life and health state of patients who were diagnosed with end stage renal  
665 disease and do not wish for renal replacement therapy can be analysed as a further sub group.  
666 Renal clearances during peritoneal dialysis and hemodialysis can be investigated in further studies  
667 as this will establish the efficiency of dialysis for patients. Quality of life of the normal population  
668 and patients receiving transplants is another potential area of further study. Treatment states of  
669 hemodialysis, peritoneal dialysis and transplant can be explored further given the possible  
670 selectivity of the subcategories of mode of therapy for patients and confounding variables  
671 implicated. There would be value in investigating further the 3 groups of patients on renal  
672 replacement therapy with controls, and comparison of data from other countries.

## 673 ***Policy implication***

674           This study should guide policies to improve quality of life of persons on renal replacement  
675 therapy. Prevention of chronic kidney disease and other lifestyle diseases in this population should  
676 be priority in healthcare. A fistula first effort for all patients on hemodialysis should be the gold  
677 standard and early fistula or graft protocols in all centres should be implemented.

678           Improved psychosocial support networks for dialysis patients and educational programmes  
679 for patients and families when deciding choice of renal replacement therapy should be introduced.

680           Hemodialysis centres require revision of protocols and strict adherence to guidelines to  
681 reduce catheter related bloodstream infections. Auditing at dialysis centres with strict quality control  
682 can be increased to focus on the issues patients encounter. Performing quality of life assessments  
683 for patients on renal replacement therapy in all centres can be instituted to improve care and

684 compare treatment with an aim to prolong survival. In other settings, patient reported outcome  
685 measurements use the KDQOL among other questionnaires for internal quality improvement  
686 activities.<sup>48</sup>

687           The institution of policies for patients to be commenced on peritoneal dialysis once they  
688 are eligible instead of hemodialysis would significantly improve the health and quality of life of  
689 these patients. Early identification of hemodialysis patients who are suitable for peritoneal dialysis  
690 can greatly contribute to better quality of life where a small percentage of patients on renal  
691 replacement therapy receive transplants. The transplantation unit in our setting is state funded and  
692 requires a nephrologist referral. Furthermore, the centre performs at most 2 live donor transplants  
693 per month. In this developing country, an enhanced renal transplantation and peritoneal dialysis  
694 service would improve health related quality of life among patients with end stage renal disease.

## 695 **Contributions to literature**

696           There are entities specific to a patient population that influences quality of life.<sup>7-8, 13, 24</sup>  
697 The diversity of elements affecting patients' health status on renal replacement have all contributed  
698 uniquely to research around the world throughout the years. Even in instances where  
699 transplantation provides a good quality of life, studies have shown other societal factors among this  
700 subcategory that significantly contribute to better scores.<sup>7-8,10</sup>

701 An article from 1995 comparing data reported from registries on renal replacement therapy around  
702 the world showed that the quantity and quality of renal replacement therapy is variable and  
703 depends to a considerable extent on the different political and socioeconomic background with the  
704 consequent differences in the health care systems existing in the various countries.<sup>49</sup>

705 In a study based at Walsgrave National Health Service Trust Hospital, on ethnicity influencing  
706 perceived quality of life of patients on dialysis and following renal transplant, it was found that  
707 Asians had a lower quality of life when compared to White Europeans.<sup>24</sup> In Brazil, unmarried and  
708 male patients presented better physical quality of life scores and among transplant recipients, the  
709 transplantation centre influenced quality of life.<sup>8</sup> Other research has shown that the introduction of

710 home dialysis, erythropoietin and vitamin D made quality of life of dialysis patients comparable with  
711 kidney transplant recipients.<sup>50</sup>

712 This study shows that biological factors like comorbidities and socioeconomic influences affect a  
713 patient's quality of life. Peritoneal dialysis is an alternative option to transplantation in our resource-  
714 limited setting as it still provides a good quality of life for patients. Many hemodialysis patients in  
715 our population utilize permanent catheters. It is seen that there is a great struggle with achieving  
716 acceptable quality of life scores among hemodialysis patients in Trinidad and Tobago despite state  
717 funding for the majority among this subgroup.

## 718 **Conclusions**

719 In small island states and lower resource environments in larger countries where provision  
720 of assets is a continuously moving target, data generated in this research can be influential in  
721 policy determination across Latin America and the Caribbean as well as island states across the  
722 globe. This study on quality of life and health state is the first in the Caribbean for patients on renal  
723 replacement therapy and has contributed novel West Indian data to the existing literature. With  
724 quality of life and state of health being invaluable measures of treatment outcome and the greater  
725 need for life saving therapy for patients diagnosed with end stage renal disease, this research  
726 should impact on the allocation of resources for chronic kidney disease patients. More importantly,  
727 it should influence the prevention and management of lifestyle diseases in this population.

728

729

730

731

732

733

734

735

736 **Abbreviations**

737

738 ANOVA-Analysis of variance

739

740 AVF-Arteriovenous fistula

741

742 AVG-Arteriovenous graft

743

744 AVF/G-Arteriovenous fistula/graft

745

746 BKD-Burden of kidney disease

747

748 BMI-Body mass index

749

750 CCI-Charlson's Comorbidity Index

751

752 CI-Confidence Interval

753

754 EKD-Effect of kidney disease

755

756 EQ-5D-3L-EuroQol

757

758 EQ-VAS-EuroQol Visual Analogue Scale

759

760 ERHA-Eastern Regional Health Authority

761

762 HD-Hemodialysis

763

764 KDQOL-Kidney Disease Quality of Life

765 KDAQOL36-Kidney Disease Quality of Life 36 item questionnaire  
766  
767 KTQ-Kidney Transplant Questionnaire  
768  
769 MCS-Mental Component Score  
770  
771 NCRHA-North Central Regional Health Authority  
772  
773 NWRHA-North West Regional Health Authority  
774  
775 PCS-Physical Component Score  
776  
777 PD-Peritoneal Dialysis  
778  
779 SE-Standard Error  
780  
781 SPKD- Symptoms and problems of kidney disease  
782  
783 SPSS-Statistical Package for the Social Sciences programme  
784  
785 STATA-Statistics and Data programme  
786  
787 SWRHA-South West Regional Health Authority  
788  
789 T-Transplant  
790  
791 TRHA-Tobago Regional Health Authority  
792  
793 TT-Trinidad and Tobago  
794

795 VAS-Visual Analogue Scale

796

797

798

799

800

801

802

803

804

805

806

807

808

809

810

811

812

813

814

815

816

817

818

819

820

821

822

823

824

825 **Ethics approval and informed consent**

826

827 Informed consent-Written consent to collect and use information was obtained from all participants  
828 in this study. The University of the West Indies Ethics Committee approved the form used to  
829 acquire the written consent.

830

831 The University of the West Indies

832 Faculty of Medical Sciences

833 Campus Ethics Committee

834 Approval: CEC007/09/15

835

836 South West Regional Health Authority

837 Office of the Director of Health

838 Research Committee

839

840 North West Regional Health Authority

841 Ethics Committee

842

843 Eastern Regional Health Authority

844 Research Committee

845

846 Tobago Regional Health Authority

847 Research Committee

848 **Consent for publication**

849

850 The corresponding author, S. Sanchez, created figure 1. All components of the map of Trinidad  
851 and Tobago: demarcations, texts, colours, labels and symbols were created with Microsoft Paint  
852 3D, 2016. The key was created with Microsoft Word 2016.

853

854 **Data availability**

855

856 The datasets used and/or analysed during the current study are available from the corresponding  
857 author on reasonable request. Most data generated or analysed during this study are included in  
858 this published article and its supplementary information files.

859

860

861 **Funding**

862

863 This research did not receive any specific grant from funding agencies in the public, commercial, or  
864 not-for-profit sectors.

865

866 **Competing interests**

867

868 The authors declare that they have no competing interests

869

870

871 **Authors' contributions**

872 Study design: SS, ST, RA, HB and GL. Data acquisition and interpretation: SS, GL, HB, ST and  
873 RA. Data analysis and statistical analysis: GL, HB, RA, ST and SS. Supervision: ST and HB. All  
874 authors have full access to the data in this study. HB and ST had final responsibility for the decision  
875 to submit the publication. Each author contributed intellectually to this study during drafting,  
876 revision and final version and all fully accept accountability for the work in this research. The  
877 STROBE (Strengthening the Reporting of OBservational Studies in Epidemiology) checklist for  
878 cross sectional studies, additional file 3, is attached for this paper.

879

880 **Acknowledgements**

881

882 Not applicable

883

884 **Disclosure**

885 The authors report no conflicts of interest in this work

886

887

888

889

890

891

892

893

894

## 895 **References**

896

897 1. Liem YS, Bosch JL, Arends LR. Quality of life assessed with the medical outcomes study short-  
898 form 36-Item health survey of patients on renal replacement therapy: a systematic review and  
899 metaanalysis. *Value Health*. 2007; 10:390–97.

900

901 2. Cameron JI, Whiteside C, Katz J, Devins GM. Differences in quality of life across renal  
902 replacement therapies: a meta-analytic comparison. *Am J Kidney Dis*. 2000; 35:629–37.

903

904 3. Makkar V, Kumar M, Mahajan R, Khaira NS. Comparison of outcomes and quality of life  
905 between hemodialysis and peritoneal dialysis patients in Indian ESRD population. *J. Clin and*  
906 *Diagnostic Res*. 2015; 9:28-31.

907

908 4. Mendes de Abreu M, Walker DR, Sesso RC, Ferraz MB. Health-related quality of life of patients  
909 receiving hemodialysis and peritoneal dialysis in São Paulo, Brazil: a longitudinal study. *Value*  
910 *Health*. 2011; 13:191-211.

911

912 5. García-Llana H, Remor E, Selgas R. Adherence to treatment, emotional state and quality of life  
913 in patients with end-stage renal disease undergoing dialysis. *Psicothema*. 2013; 25:79-86.

914

915 6. Bakewell AB, Higgins RM, Edmunds ME. Quality of life in peritoneal dialysis patients: decline  
916 over time and association with clinical outcomes. *Kidney Int*. 2002; 61: 239-48.

917

918 7. Fiebiger W, Mitterbauer C, Oberbauer R. Health-related quality of life outcomes after kidney  
919 transplantation. *Health Qual. Life Outcomes*. 2004; 2:2. doi: 10.1186/1477-7525-2-2.

920

- 921 8. Alvares J, Cesar CC, Acurcio Fde A, Andrade EI, Cherchiglia ML. Quality of life of patients on  
922 renal replacement therapy in Brazil: comparison of treatment modalities. *Qual. Life Res.* 2012;  
923 21:983-91.  
924
- 925 9. Laupacis A, Keown P, Pus N et al. A study of the quality of life and cost utility of renal  
926 transplantation. *Kidney Int.* 1996; 50:235-42.  
927
- 928 10. Oliveira de Mendonça AE, Torres G, Salvetti M, Alchieri JC, Costa IKF. Changes in quality of  
929 life after kidney transplantation and related factors. *Acta Paul Enferm.* 2014; 27:287-92.  
930
- 931 11. Eduardo N, Rodrigues, R, Barata C. Dyadic relationship and quality of life of patients with  
932 chronic kidney disease. *J Bras Nefrol.* 2015; 37:315-22.  
933
- 934 12. Liem YS, Bosch JL, Hunink MG. Preference based quality of life of patients on renal  
935 replacement therapy: a systematic review and meta-analysis. *Value Health.* 2008; 11:733-41.  
936
- 937 13. Panagopoulou A, Hardalias A, Berati S, Fourtounas C. Psychosocial issues and quality of life in  
938 patients on renal replacement therapy. *Saudi J Kidney Dis Transpl.* 2009; 20:212-8.  
939
- 940 14. Valderrabano F, Jofre R, Lopez-Gomez, JM. Quality of life in end stage renal disease patients.  
941 *Am J Kidney Dis.* 2001; 38:443-64.  
942
- 943 15. Sayin A, Mutluay R, Sindel S. Quality of life in hemodialysis, peritoneal dialysis and  
944 transplantation patients. *Transplant. Proc.* 2007; 39:3047-53.  
945
- 946 16. Khan S, Bisnath R, Jaipaul J et al. Screening for chronic kidney disease in East Trinidad using  
947 the National Kidney Foundation guidelines. <https://www.semanticscholar.org>.2015.

948 17. Soyibo AK, Barton EN. Report from the Caribbean Renal Registry. *West Indian Med J.* 2007;  
949 56:355.  
950

951 18. Roberts L, Ramsaroop K, Seemungal T. Survival outcomes in renal transplantation in Trinidad  
952 and Tobago: SORTTT study. *West Indian Med J.* 2012; 61:422-8.  
953

954 19. International Standard Classification of Occupations of the United Nations. ISCO 08. 2010.  
955 [www.ilo.org/public/english/bureau/stat/isco](http://www.ilo.org/public/english/bureau/stat/isco). Accessed 16 Nov 2019.  
956

957 20. World Health Organization. Global Database on Body Mass Index: an interactive surveillance  
958 tool for monitoring nutrition transition. [who.int/bmi/index](http://who.int/bmi/index). 2008. Accessed 16 Nov 2019.  
959

960 21. World Health Organization. International Classification of Diseases and Related Health  
961 Problems. ICD 10.2016. [www.who.int/classifications/icd/ICD10Volume2,Version 2016](http://www.who.int/classifications/icd/ICD10Volume2,Version 2016). Accessed  
962 16 July 2019.  
963

964 22. Tillin T, Sattar N, Godsland IF, Hughes AD, Chaturvedi N, Forouhi NG. Ethnicity specific  
965 obesity cut-points in the development of type 2 diabetes mellitus-a prospective study including  
966 three ethnic groups in the United Kingdom. *Diabetic Med.* 2015; 32:226-34.  
967

968 23. Charlson ME, Pompei P, Ales KL, MacKenzie CR. A new method of classifying prognostic  
969 comorbidity in longitudinal studies: development and validation. *J Chronic Dis.* 1987; 40:373-83.  
970

971 24. Bakewell AB, Higgins RM, Edmunds ME. Does ethnicity influence perceived quality of life of  
972 patients on dialysis and following renal transplant? *Nephrol. Dial Transplant.* 2001; 16:1395-1401.

- 973 25. Yee Chow SK, Ling Tam BM. Is the kidney disease quality of life-36(KDQOL-36) a valid  
974 instrument for Chinese dialysis patients? *BMC Nephrol.* 2014; 15:199.  
975
- 976 26. Chen JY, Choi EPH, Wan EYF et al. Validation of the disease specific components of the  
977 Kidney Disease Quality of Life-36(KD-QOL 36) in Chinese dialysis patients undergoing  
978 maintenance dialysis. *PLos One.* 2016; 11: e0155188. doi: 10.1371/journal.pone.0155188.  
979
- 980 27. Ricardo AC, Hacker E, Lora CM et al. Validation of the kidney disease quality of life-36 short  
981 form 36 (KDQOL-36) US Spanish and English versions in a Cohort of Hispanics with chronic  
982 kidney disease. *Ethn Dis.* 2013; 23:202-9.  
983
- 984 28. Kurella M, Luan J, Yaffe K, Chertow GM. Validation of the kidney disease quality of life  
985 (KDQOL) cognitive function subscale. *Kidney Int.* 2004; 66:2361-7.  
986
- 987 29. Bailey H, Stolk E, Kind P. Toward explicit prioritization for the Caribbean: An EQ-5D value set  
988 for Trinidad and Tobago. *Value Health.* 2016; 11:60-7.  
989
- 990 30. Tayyebi A, Raiesifar A, Mehri SN, Ebadi A, Einolahi B, Pashandi S. Measuring health related  
991 quality of life in renal transplant patients: psychometric properties and cross cultural adaptation of  
992 the kidney transplant questionnaire in Persian. *Nephro-Urol.* 2012; 4:617-21.  
993
- 994 31. Wilson B, Cleary PD. Linking clinical variables with health related quality of life. *JAMA.* 1995;  
995 273:59-64.  
996

- 997 32. Robinson BM, Akizawa T, Jager KI, Kerr PG, Saran R, Pisoni RL. Factors affecting outcomes  
998 in patients reaching end stage kidney disease worldwide: differences in access to renal  
999 replacement therapy, modality use, and hemodialysis practices. *Lancet*. 2016; 388:294-306.  
1000
- 1001 33. Evans RW, Manninen L, Garrison LP et al. The quality of life of patients with end stage renal  
1002 disease. *N Engl J Med*. 1985; 312:553-59.  
1003
- 1004 34. Rabbat CG, Thorpe KE, Russell JD, Churchill DN. Comparison of Mortality Risk for Dialysis  
1005 Patients and Cadaveric First Renal Transplant Recipients in Ontario, Canada. *Clin J Am Soc*  
1006 *Nephrol*. 2000; 11:5917-22.  
1007
- 1008 35. Don YK, Tammy KC, Myoung-Hee K et al. Superior outcomes of kidney transplantation  
1009 compared with dialysis: An optimal matched analysis of a national population-based cohort study  
1010 between 2005 and 2008 in Korea. *Medicine*. 2016; 95:4352.  
1011 doi:10.1097/MD.0000000000004352.  
1012
- 1013 36. Francisco ALM, Fresnedo GF, Palomar R, Pinera C, Arias M. The renal benefit of a healthy  
1014 lifestyle. *Kidney Int*. 2005; 69:52-6.  
1015
- 1016 37. Chen MC, Tsai WL, Tsai IC et al. Arteriovenous fistula and graft evaluation in hemodialysis  
1017 patients using MDCT: a primer. *Am Journal Roentgenol*. 2010; 194:838-47.  
1018
- 1018 38. Wasse H, Kutner N, Zhang R, Huang Y. Association of initial HD vascular access with patient  
1019 reported health status and quality of life. *Clin J Am Soc Nephrol*. 2007; 2:708-71.  
1020

- 1021 39. Mohamed-Ali V, Goodrick S, Bulmer K, Holly JM, Yudkin JS, Coppack SW. Production of  
1022 soluble tumor necrosis factor receptors by human subcutaneous adipose tissue in vivo. *Am J*  
1023 *Physiol.* 1999; 277:971-75.  
1024
- 1025 40. Demas GE, Drazen DL, Nelson RJ. Reductions in total body fat decrease humoral  
1026 immunity. *Proc Royal Soc B.* 2003; 270: 905-11.  
1027
- 1028 41. Beddhu S. The body mass index paradox and an obesity, inflammation, and atherosclerosis  
1029 syndrome in chronic kidney disease. *Semin Dial.* 2004; 17:229-32.  
1030
- 1031 42. Kalantar-Zadeh K, Abbott KC, Salahudeen AK, Kilpatrick RD, Horwich TB. Survival advantages  
1032 of obesity in dialysis patients. *Am J Clin Nutr.* 2005; 81:543-54.  
1033
- 1034 43. Ikizler TA. Resolved: Being fat is good for dialysis patients: The Godzilla Effect. *J Am Soc*  
1035 *Nephrol.* 2008; 19:1059-64.  
1036
- 1037 44. Gerasimoula K, Lefkothea L, Maria L, Victoria A, Paraskevci T, Maria P. Quality of life in  
1038 hemodialysis patients. *Mater Sociomed.* 2005; 27:305-9.  
1039
- 1040 45. McHorney CA, Tarlov AR. Individual-patient monitoring in clinical practice: are available health  
1041 status surveys adequate. *Qual Life Res.* 1995;4:293–307.  
1042
- 1043 46. Dweib K, Jumaa S, Khmour M, Hallak H. Quality of life for kidney transplant palestinian patients.  
1044 *Saudi J Kidney Dis Transpl.* 2020; 31(2):473. doi: 10.4103/1319-2442.284023.  
1045

- 1046 47. Chisholm-Burns MA, Erickson SR, Spivey CA, Gruessner RWG, Kaplan B.  
1047 Concurrent validity of kidney transplant questionnaire in US renal transplant recipients  
1048 *Patient Prefer Adherence*. 2011; 5:517–522. doi: 10.2147/PPA.S24261.  
1049  
1050 48. Peipert JD, Hays RD. Using patient reported measures in dialysis clinics. *Clin J Am Soc*  
1051 *Nephrol*. 2017; 12:1889-91. doi:10.2215/CJN.02250217.  
1052  
1053 49. Amico GD. Comparability of the different registries on renal replacement therapy. *Am J Kidney*  
1054 *Dis*. 1995; 25(1):113-8. doi: 10.1016/0272-6386(95)90637-1  
1055  
1056  
1057 50. Milovanov YS, Dobrosmyslov IA, Milovanova SY et al. Quality of Life of Chronic Kidney  
1058 Disease Patients on Renal Replacement Therapy. *Ter Arkh*. 2018; 20; 90(6):89-91. doi:  
1059 10.26442/terarkh201890689-91.  
1060  
1061  
1062  
1063  
1064

# Figures

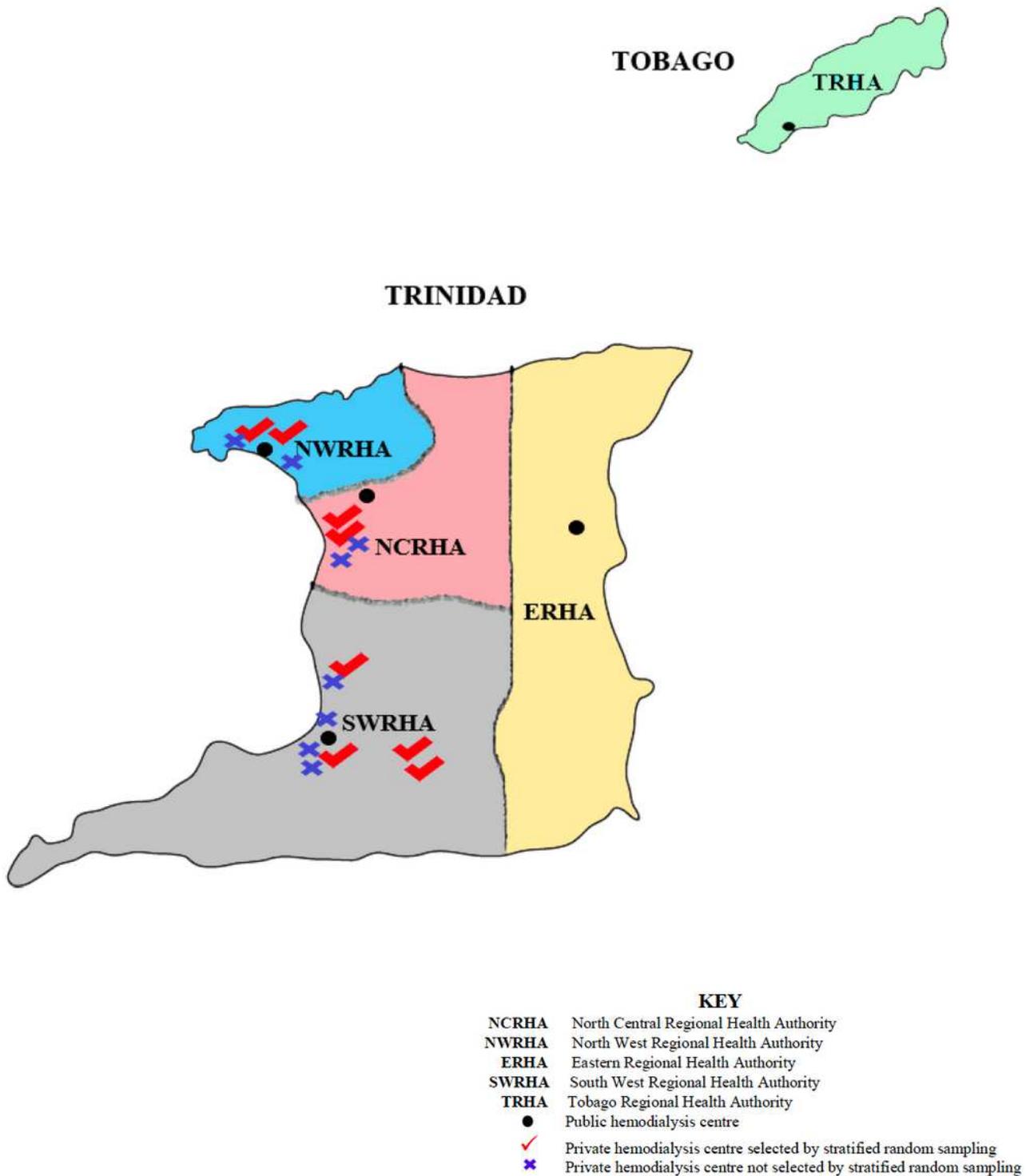
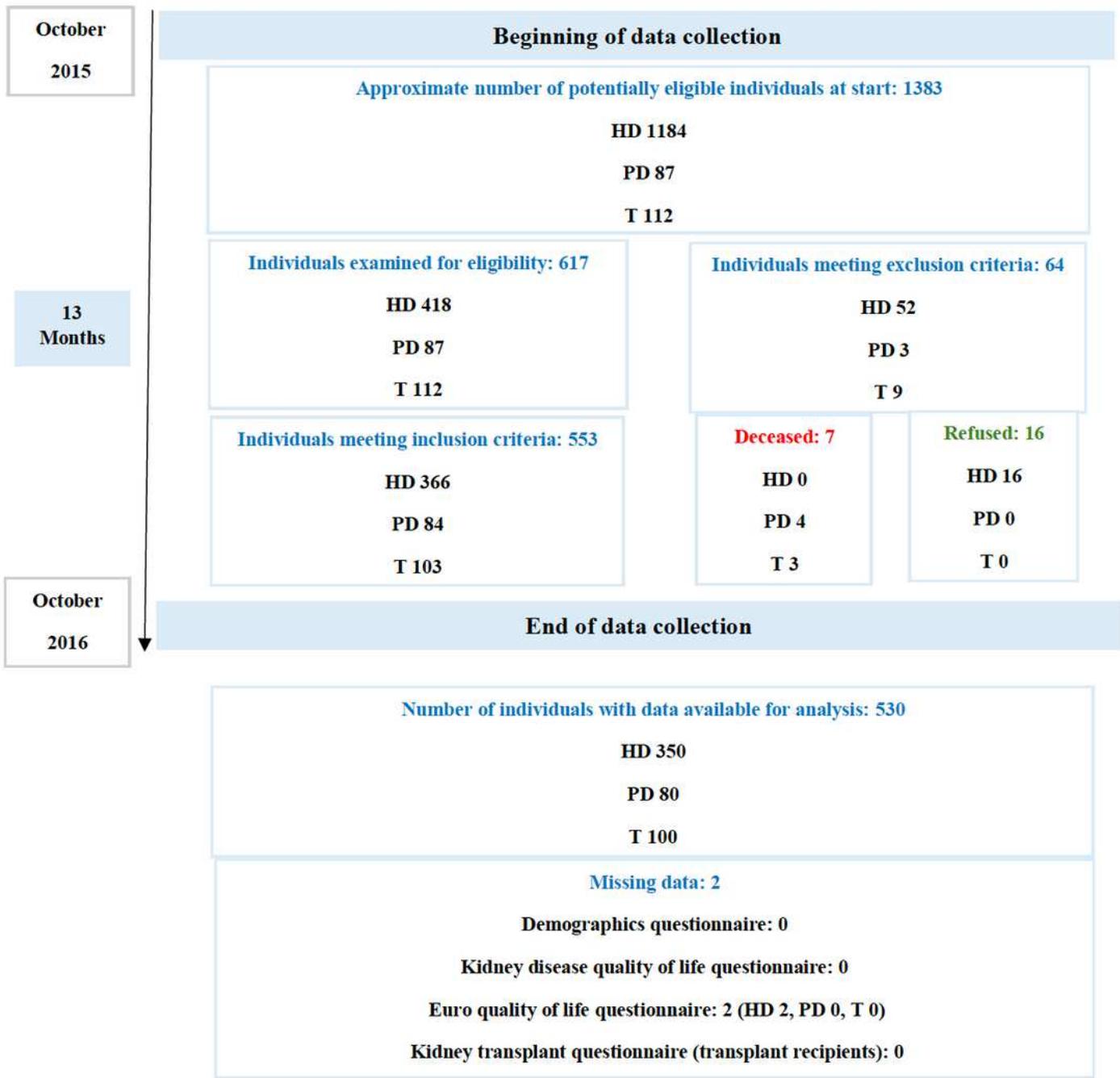


Figure 1 was created with Microsoft Paint 3D 2016 and the key was created with Microsoft Word 2016

Figure 1

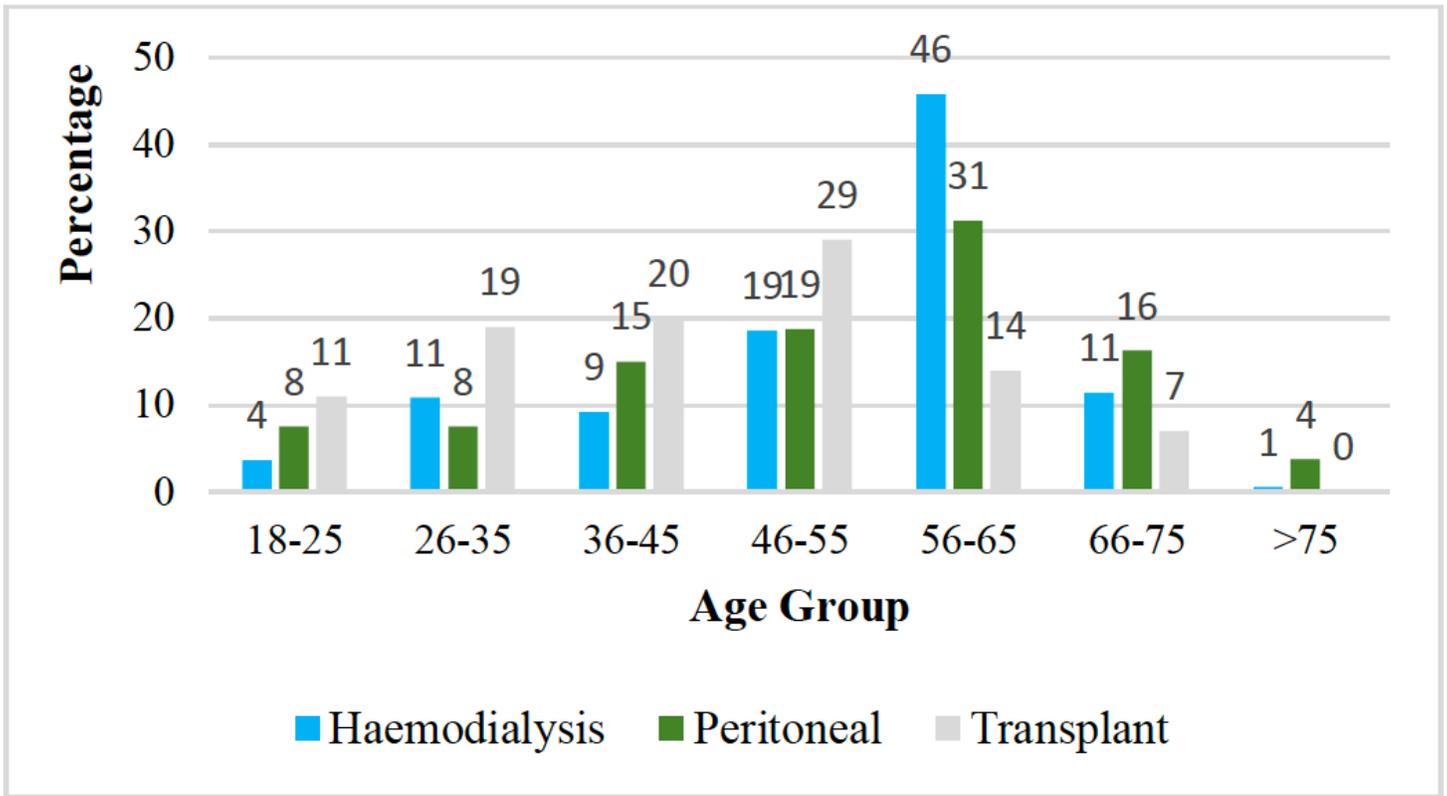
Stratified random sampling of private hemodialysis centers in Trinidad and Tobago



HD-Hemodialysis, PD-Peritoneal dialysis, T-Transplant

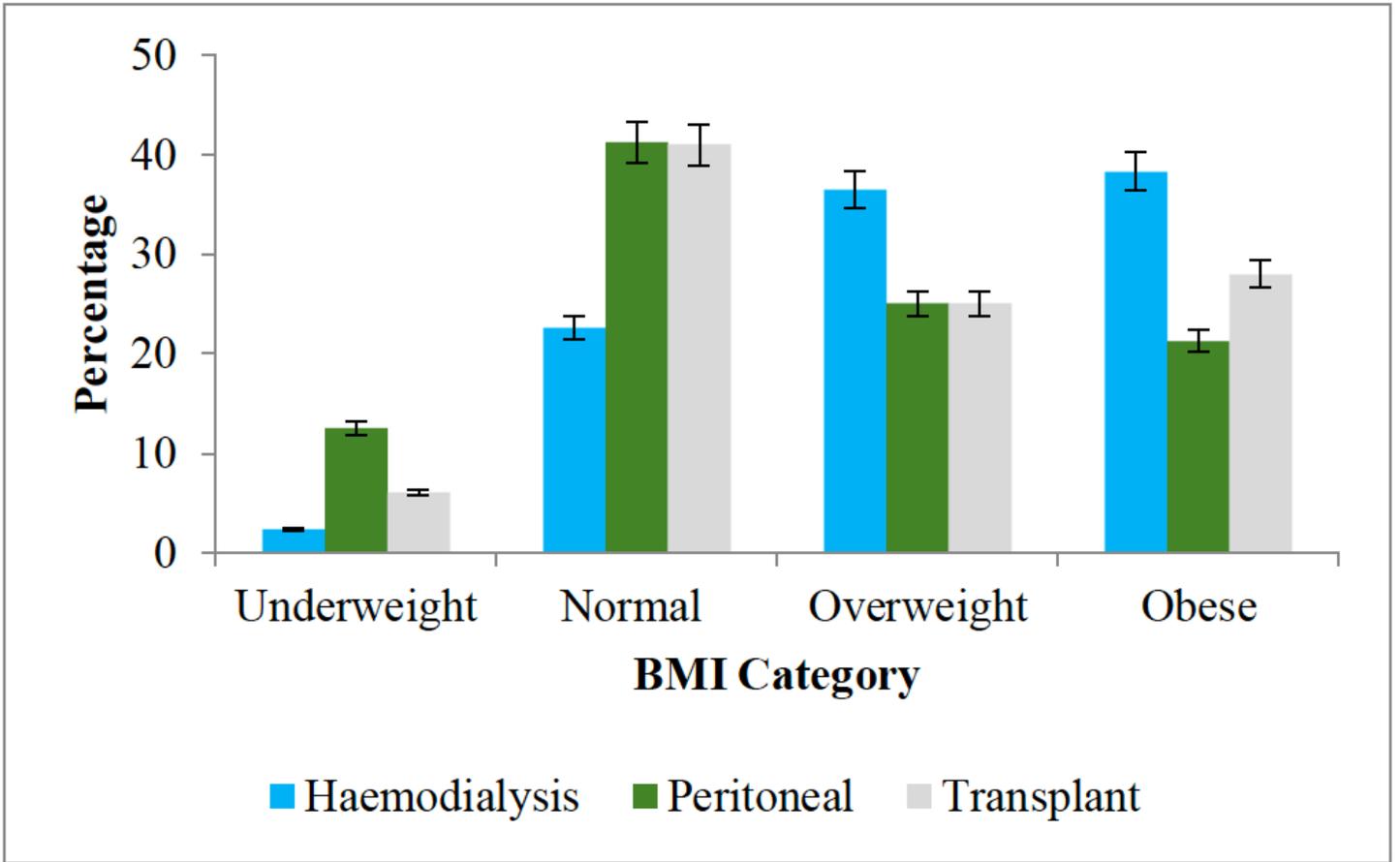
**Figure 2**

Individuals at each stage of study



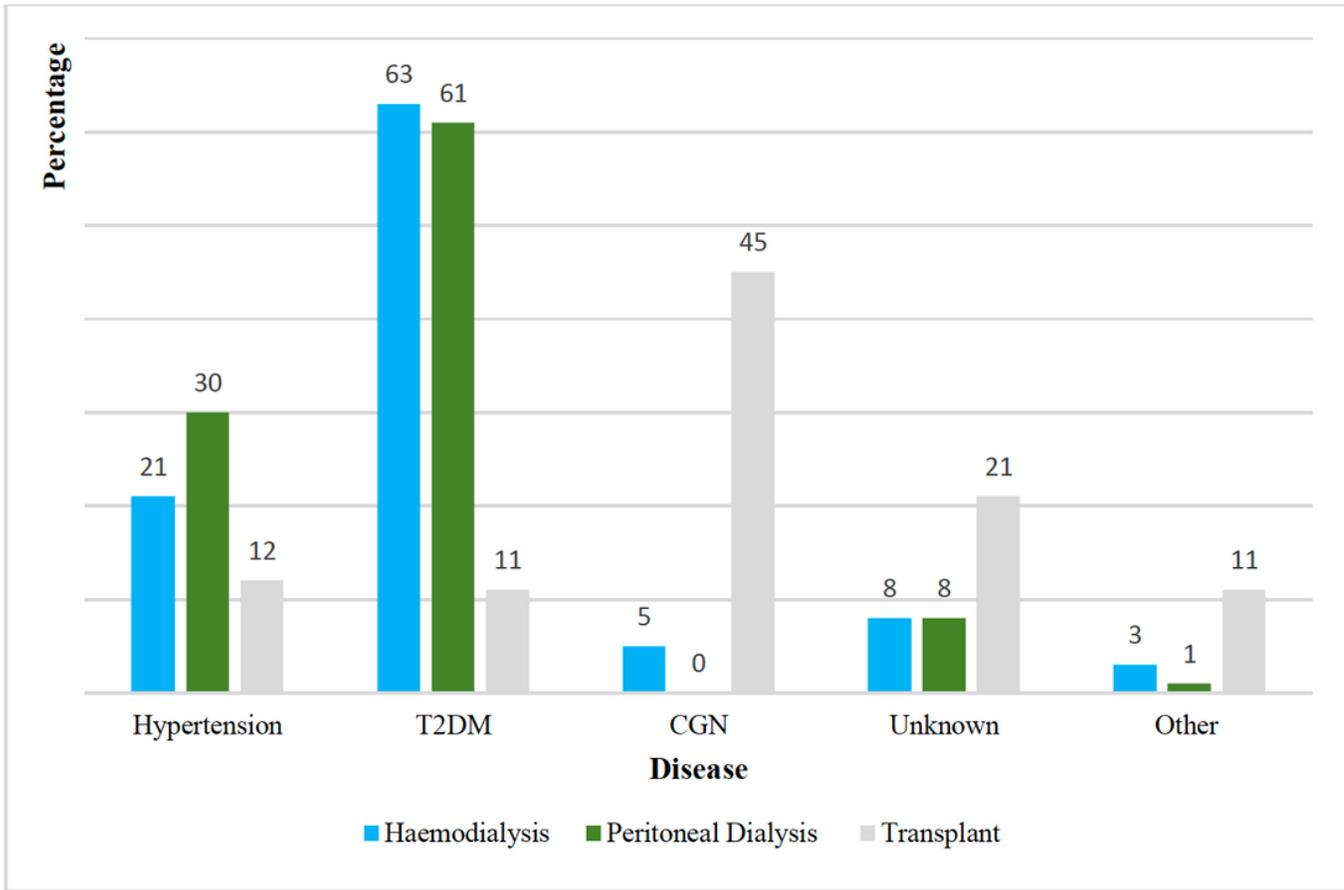
**Figure 3**

Age groups of patients on renal replacement therapy



**Figure 4**

Body Mass Index (BMI) category and mode of therapy



T2DM-Type 2 Diabetes Mellitus, CGN-Chronic glomerulonephritis, Other-Polycystic kidney disease, Type 1 Diabetes Mellitus, Reflux nephropathy

**Figure 5**

Self-reported cause of chronic kidney disease

## Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [Additionalfile1supplementarytable1.pdf](#)
- [Additionalfile2supplementaryfigure1.docx](#)
- [Additionalfile3STROBEchecklist.docx](#)