

**Cost Estimation of Hemodialysis among Patients with
Chronic Kidney Disease in 500-Bedded Yangon Speciality Hospital**

*Thandar Tun**, *Yadanar* & *Kyaw Swa Mya*

University of Public Health

Chronic Kidney Disease (CKD) is an important cause of death and loss of disability-adjusted-life-years worldwide. Every stage of CKD management imposes a substantial financial burden on the health system, and patients and their households by increasing out-of-pocket payments. The objectives of the study were to estimate the direct and indirect cost, and to explore the coping methods of patients with CKD in 500-bedded Yangon Speciality Hospital. Hospital-based, cross-sectional descriptive study was conducted among 55 adult dialysis patients who had registered for more than one month at the Out-Patient Department of the Renal Medical Unit. Data were collected by pre-tested semi-structured face-to-face interview questionnaire and reviewing vouchers and medical records. The median value of monthly out-of-pocket expenditure on hemodialysis was 594,000 Myanmar Kyat (MMK), in which 476,200 MMK cost for direct-medical, 81,000 MMK for direct non-medical and 80,000 MMK for indirect expenditures. One-unit cost for hemodialysis was highest 53,750 MMK at a private hospital and lowest 12,000 MMK at a charitable hospital. Meal and transportation cost 12,000 MMK and 28,000 MMK per month. Sixteen attendances lost their wages about 72,000 MMK per month. The most common coping methods were using income (96%) and selling assets (71%). Public hospital can support dialysis only once a week for a registered patient. All patients have to seek care from the private and charitable hospital that increase the treatment cost for that chronic disease. Hence, the government should provide more new renal dialysis centers and should establish a sound financial protection mechanism.

Keywords: Chronic kidney disease, Coping, Hemodialysis, Out-of-pocket expenditure

INTRODUCTION

Chronic Kidney Disease (CKD) is one of the significant drivers of health-related expenditure and one of the growing challenges among non-communicable diseases (NCDs) for the health system.¹ The number of patients with CKD is expected to grow at the fastest rate in the poorest part of the world. The low economic level contributes to less availability of dialysis.² The burden of CKD is underestimated globally although it is emerging as a major public health problem. The costs of renal replacement therapy (RRT) are high and health care budgets are

out of reach for developing countries.³ Estimation of the treatment costs for CKD increases as the disease severity worsens. It is needed to assess the economic benefits of interventions that slow the progression of kidney diseases.⁴ Prevalence of CKD is estimated to be 8-16% worldwide and recognized as a public health problem.² According to the 2010 Global Burden of Disease study that ranked the causes of death worldwide in 1990 and 2010, CKD climbed

*To whom correspondence should be addressed.
Tel: +95-95321466
E-mail: thandardorawhyte@gmail.com
DOI: <https://doi.org/10.34299/mhsrj.009117>

the list from 27th to 18th position over two decades.⁵ Although the accurate prevalence of CKD is unknown in Myanmar, the annual mortality rate per 100,000 people from CKD has increased by 21.5% since 1990, an average of 0.9% a year and the annual year of healthy life lost per 100,000 people is 666.6.⁶

The health care cost of CKD imposes a financial burden on both health systems and patients and their house-holds by increasing out-of-pocket (OOP) payments.⁷ Among all stages of CKD, patients with a higher stage (stage 3 or 4) of CKD cost more (2 to 4 times higher) than those who did not progress.⁸ A study from India was conducted to describe the management of end-stage renal disease discovered that most of the patients usually used own expenses for RRT. At the same time, about two-thirds took help from employees or charitable organization, one-third sold the property, and a quarter took loans to cover the treatment cost. Only 4% were able to cover the cost from within their family resources.⁹ The exact cost of RRT in developing countries is hard to estimate and varies with prescription.¹⁰ The cost also depends on the late presentation, resulting in poor clinical outcomes with frequent and long-term hospitalizations.¹¹ Concerning on the service availability, readiness and quality, RRT largely depend on the economic conditions, the political and social structure, overall health care facilities and the health care financing strategies of a country.¹² The incidence and prevalence of CKD have significantly increased and the disease consumes a huge proportion of healthcare cost.¹³

Although Myanmar is trying to reduce OOP expenditure for healthcare service, evidences showed that nearly 25% of household experienced catastrophic health expenditure in paying OOP payments for general inpatient services.¹⁴ As for disease-specific evidence, there were very limited studies that investigated the association between chronic diseases and OOP expenditure in Myanmar. Hence, the study intended to estimate all direct and indirect cost of hemodialysis and the coping methods among CKD patients.

These findings can support national programs for early detection of CKD to retard loss of renal function and need for dialysis that can reduce the cost of care of CKD.

MATERIALS AND METHODS

It was a hospital-based cross-sectional descriptive study conducted from 1st September 2017 to 30th June 2018 among hemodialysis patients registered at the Out-Patient Department (OPD) of Renal Medical Unit at 500-bedded Yangon Speciality Hospital. In this study, Yangon Region is purposively selected because it is a city equipped with highly facilitated tertiary hospitals. Among five public dialysis centers in Yangon, the 500-bedded Yangon Speciality Hospital was chosen because it is only one hospital for specialty care with full capacity. Patients of age more than 18 years and who undergo hemodialysis for more than one month were eligible for this study.

The minimal sample size was 53 and calculated by using formula $n = z^2 \sigma^2 / d^2$,¹⁵ where σ , the value was reference from SD value of 73.6 Rupees (and transformed to Myanmar Kyat (MMK) by multiplying with 20 which was the current exchange rate of February 2018, Myanmar).¹⁶ After pretesting and having consent, data for the cost of hemodialysis were consecutively collected until the required sample size was obtained by face-to-face interview method using questionnaire. Both patients or their attendants were inter-viewed. The questionnaire mainly focused on socio-demographic characteristics and the various types of cost, such as direct medical, direct non-medical and indirect costs. Direct medical costs were those incurred during treatment, such as costs for drugs, investigations, formal payment for special care and dialysis. Direct non-medical costs included costs other than the above categories such as accommodation, transportation, and meal for patients and their attendants. The indirect costs were the daily wage loss of both patients and attendants during the treatment. Additional eight questions were included to explore coping methods.

The purchased medical vouchers were also reviewed for accuracy and to avoid estimation of the cost identified by the attendants. If the attendant made estimation, each medicine's type and cost for hypertension, heart disease, other co-morbid disease was asked, and also, frequencies of drug intake investigations and medical equipment was calculated for monthly cost. For non-medical cost and indirect cost, every single visit was asked to calculate the monthly value.

Data management and analysis

Data were entered, cleaned, and analyzed using IBM SPSS (Statistical Package for Social Science) version 16.0. The background characteristics were described by frequency and graphs. The distribution of the OOP expenditure was not normal and shown by the median and interquartile range. Unit cost for hemodialysis varies by places (public, private and charitable hospital). The monthly cost of dialysis was also calculated by summation of all direct medical, direct non-medical and indirect costs within one month and divided by the frequency of visits.

For the patients who did hemodialysis at both private and charitable hospitals in alternate month, costing was calculated by the average of the cost of both places. Coping methods were asked by questions and described with frequency by types of methods and some statements were also described in words. Direct medical cost means the cost relating to the provision of medical services in which consultant fees, drug costs, Laboratory examinations, X-ray costs and dialysis cost are included.

Direct non-medical cost includes the cost of informal payment, accommodation, meal and travel cost for both patient and care givers. Indirect cost or productivity cost in this study means daily wage loss of both patient and care givers. Dialysis cost means the cost for hemodialysis including costs for dialyzers, tubing and consumables (excluding drugs).

Ethical consideration

Ethical approval was obtained from the Institutional Review Board of the University

of Public Health (ITERB 2018/Research/4). The individuals were invited to participate in the research and that participation was voluntary. Informed consent was obtained from all participants after assuring confidentiality. The coding system was used in collecting and managing the data. The results of the study were used only for health care and research purposes.

RESULTS

Yangon Speciality Hospital provides dialysis care on every weekday. The renal medical unit for treatment hemodialysis has 21 beds for routine procedure, 6 beds for infection positive cases (HBV, HCB, HIV). There were morning and evening sessions for dialysis with the maximum capacity of 42 infection free patients each day. Patients who need to take dialysis have to register and wait for their turn. And the hospital can provide dialysis only once a week for a registered patient. Therefore, patients need to seek care from outside of the public hospital to get full dialysis treatment (twice a week). Most patients got the necessary care from a charitable hospital. However, that charitable hospital can provide dialysis once a week for an alternate month for a registered patient. Furthermore, patients need to take treatment from a private hospital to fulfill the treatment in alternate month. It is because a patient needs at least twice of hemodialysis treatment in a week (8 times a month) to maintain their health. There were patients who had queued for enrollment to take treatment in public hospital, and also in charitable hospital.

Patients' characteristics

The samples of 55 hemodialysis patients or their attendants were consecutively interviewed at a selected public hospital with the exclusion of critically ill patients. As participants' characteristics, 53% were within the working age group of 40-59 years, 60% female patients, 66% married, 69% high school and above education level and only 26% dependent. More than two-thirds (76%) came from the Yangon Region and 36.5% of patients had only one income earner in a family.

More than one-third of patients had a family income of 300,001-500,000 MMK and 80% came with attendance. More than half 58.2% of patients had lost their jobs after suffering CKD. Past medical history showed that almost all (89.1%) respondents had hypertension, but nearly one-fourth (23.6%) had diabetes mellitus. Among the patients, 47% had CKD for less than three years and 62% of patients were taking hemodialysis treatment for less than three years (Table 1).

Cost for hemodialysis

All the expenditure was calculated for the cost within the one-month duration of treatment. Monthly total health expenditure was 594,000 MMK, (474,400-783,300) median (IQR). Direct medical cost was 476,200 MMK (375,900-587,200), direct non-medical cost 81,000 MMK (60,500-140,000), and indirect cost 80,000 MMK (53,000-100,000), respectively (Table 2). Among direct medical costs, drug costs for CKD were the highest 168,000 MMK (104,000-220,000). Dialysis cost depends on the place of care (public, private or charitable hospital) because patients had to take treatment from an outside clinic to get a full course (at least twice a week) of treatment. These outside clinics included a private hospital and a charitable hospital.

Therefore, the monthly out-of-pocket expenditure (direct medical cost only for dialysis) for those who did hemodialysis at public and private hospital was 310,000 MMK (292,000-334,000), at public, the private and charitable hospital was 213,000 MMK (194,750-236,750), public and charitable hospitals were 122,000 MMK (114,000-134,500) and only at the public hospital was 74,000 MMK. The unit of the public hospital was 18,750 MMK, the private hospital was 53,750 MMK, and the charitable hospital was 12,000 MMK. Two patients did not go to a private or charitable hospital and got treatment only once a week at a public hospital (Table 2 & 3).

Coping methods

Almost all 96% of the respondents paid the treatment cost with household income and more than two-third 71% solved by selling

Table 1. Background characteristics of the hemodialysis patients (n=55)

	Variables	Frequency (%)
Age group (Years)	<40	14(25.5)
	40-59	29(52.7)
	>60	12(21.8)
Gender	Male	22(40)
	Female	33(60)
Marital status	Single	14(25.5)
	Married	36(65.5)
	Widowed	3(5.5)
	Divorced	2(3.6)
Education	Illiterate	2(3.6)
	Primary school level	7(12.7)
	Middle school level	8(14.5)
	High school level	19(34.5)
	University	4(7.3)
	Graduate and above	15(27.3)
Occupation	Dependent	14(25.5)
	Government employed	9(16.4)
	Private employed	4(7.3)
	Own-business	17(30.9)
	Farmer	7(12.7)
	Manual labor	4(7.3)
Address (Regions)	Yangon	42(76.4)
	Others	13(23.6)
Income earner	0	5(9.0)
	1	20(36.5)
	>=2	30(54.5)
Loss of job	Yes	32(58)
	No	23(42)
Average monthly family income (MMK)	Less than 300,000	14(25.5)
	300,001-500,000	19(34.5)
	500,001-600,000	9(16.4)
	600,001-1,500,000	13(23.6)
Attendance	Present	44(80)
	Not present	11(20)
Past medical history	Hypertension	49(89)
	Diabetes Mellitus	13(24)
	Both	11(20)
	Others	9(16)
History of CKD	Less than 3 years	26(47)
	More than 3 years	29(53)
History of hemodialysis	Less than 3 years	34(62)
	More than 3 years	21(38)

assets. More than half (55%) used saving, (44%) got support from the charity, (42%) coped by loaning, and (36%) coped by pawning. Others (13%) included supports from friends, relatives, offspring, brother, and parents (Fig. 1). The followings are statements of coping experiences obtained from face-to-face interview with selected hemodialysis patients using coping questions such as selling asset, taking loan etc., A 49-year-old female, 32 months duration of hemodialysis described her experience of

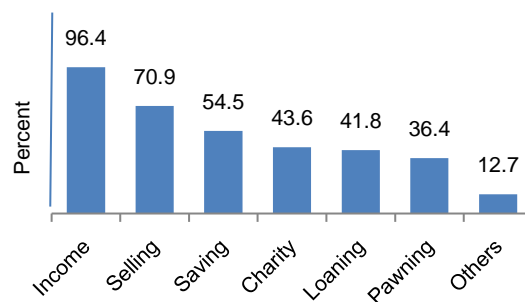


Fig. 1. Distribution of coping methods by the respondents

Table 2. Monthly OOP expenditure for hemodialysis patients due to CKD

Variables	No.	Median (IQR)(MMK)
<i>Monthly OOP for hemodialysis patients</i>		
Direct medical expenditure	55	476,200 (375, 900-587,200)
Direct non-medical expenditure	55	81,000 (60,500 -140,000)
Indirect cost	17	80,000 (53,000-100,000)
Total health expenditure	55	594,000 (474,400-783,300)
<i>Direct medical cost</i>		
Investigations	45	23,000 (15,000-47,000)
Drugs for hypertension	45	10,200(4,650-18,950)
Drugs for diabetes mellitus	8	10,000(5,700-15,750)
Drugs for other diseases	4	25,400(6,750-48-250)
Drugs for CKD	55	168,000(104,000-220,000)
Cost of other injectable drugs* for CKD	12	57,500(6,875-272,000)
<i>Hemodialysis cost</i>		
Public and private	30	310,000 (292,000-334,000)
Public, private and charity	17	213,000 (194,750-236,750)
Public and charity	6	122,000 (114,000-134,500)
Public only	2	74,000
<i>Direct non-medical cost</i>		
Meal (patients and attendances)	52	12,000(8,000-19,000)
Transportation (patients and attendances)	55	28,000 (20,000-40,000)
Accommodation fees	1	100,000
<i>Indirect cost</i>		
Wage loss (patients)	4	100,000 (40,000-190,000)
Wage Loss (attendances)	16	72,000 (40,000-80,000)

*Other injectable drugs included drugs, blood transfusion, albumin infusion, surgery and hospitalization cost due to CKD among 12 patients.

Table 3. Variation of monthly out-of-pocket expenditure for hemodialysis by hospital

Variables	No.	Median (IQR)(MMK)	Unit cost (MMK)
Public	55	75,000 (74,000-11,2000)	18,750
Private	30	215,000 (194,750-243,750)	53,750
Private and charity	17	131,500 (128,750-149,000)	32,875
Charity	6	48,000	12,000

selling assets and loss of a job that *“Our family members earn by sewing dresses. I did it before and cannot do it now. My sisters support me by sewing and I am very thankful to them. All my savings and jewelry were sold out”*.

A 41-year-old female, 14 months duration of hemodialysis described the supports from the charitable hospital that *“When I have suffered this disease, my husband and I gave up our job as teachers and moved to Yangon, living in a monastery. We cannot take care of our children. My husband earns by selling fruits here staying in a monastery. It is a relief that we are getting support from Bar Lann Charitable Hospital”*.

A 44-year-old male with 45 months duration of hemodialysis expressed supports from relatives that *“We lived in Myeik, but moved to Yangon to cure disease and our only son left in there. He works fishery and supports us. And our relatives give financial supports when we do not have enough of it”*.

DISCUSSION

The total health care expenditure was estimated from 55 hemodialysis patients and explored how they used to overcome their burdens. The majority of hemodialysis patients were 40-59 years of the productive working-age population and about three-fourth were previously employed. More than one-third of the respondents' families had only one income earner and even there were certain proportion of households with no income earner. This factor reflected the unaffordability to the treatment they need. Most of the respondents came to the hospital with their family members.

As a result, the attendants had a higher chance of losing their jobs. For patients, nearly 60% has lost their job while they suffered from the disease and took the treatment, and they cannot do their work. It was an important loss for a family to face unemployment that can push a family into poverty. This finding is consistent with the Sri Lanka study where the proportion of job

loss population was 51%.¹⁷ There were 58% of the job loss among the hemodialysis patients after suffering the CKD and it was also consistent with an Australia study which showed a high proportion of unemployment rate.⁷

It was also found that almost all of the patients had a history of hypertension and nearly one-fourth had diabetes mellitus. Early screening and prompt treatment of these underlying diseases are essential to prevent CKD. This finding also coincided with other international studies.^{16, 18} Nearly half of patients suffered CKD for less than three years and nearly 40% have taken treatment of hemodialysis for less than three years. This pointed out that patients only noticed kidney disease only when they need dialysis treatment. It is very important to diagnose and manage underlying diseases to prevent the early onset of CKD. It reflected the lack of awareness and health knowledge to save the kidneys in time.

Among the monthly OOP expenditure, direct medical expenditure was the highest proportion of all cost. This figure was much higher than the dialysis patients of Sri Lanka after balancing the currency.¹⁷ Among the direct medical cost, drugs cost for CKD was higher than the investigation cost and cost of medicine for hypertension and diabetes mellitus. The major driving cost for CKD patients was hemodialysis costs. Unit cost for hemodialysis was highest at a private hospital and charitable hospital cost the least.

Unaffordable patients cannot get regular treatment. Two patients did not go to a private or charitable hospital and got once a week for treatment. If the public hospital can provide full treatment, it can reduce OOP expenditure by 50%. The current cost was lower than the public hospital in South India¹⁶ but higher than hospitals in Sri Lanka.¹⁷ According to the necessity of treatment for survival, all patients coped to overcome the cost of hemodialysis by various methods. Using income and selling the assets were the most frequently used coping methods among the respondents.

Conclusion

The public hospital cannot support the full course of treatment for all CKD patients. Patients tried to take the treatment with high healthcare costs from a private hospital and faced financial hardship.

Although charitable hospital subsidizes the hemodialysis cost, the accessibility of the service is only for a limited number of patients. The financial burden was present for almost all patients that they used their assets to overcome it.

Recommendation

In order to access efficient and equitable health care, it is necessary to develop a financial protection mechanism to protect the hemodialysis patients from financial hardship and missing of treatment. Both human resource and infrastructure should be expended in a central dialysis center and township hospitals.

Charitable hospitals should be encouraged by local authorities and the community. Moreover, programs for early detection of CKD should be widely introduced in every township to retard the loss of renal function and need for dialysis that can reduce the cost of care for CKD.

Competing interests

The authors declare that they have no competing interests.

ACKNOWLEDGMENT

This study was supported by the grant from the Department of Medical Research, Yangon, Myanmar (2017). We are grateful to the persons; Professor Khay Mar Mya, Rector of University of Public Health, Yangon, Dr. Than Htut, Senior Medical Superintendent, 500-Bedded Yangon Speciality Hospital, Dr. Khin Thida Thwin (Professor and Head, Department of Renal Medical Unit, 500-Bedded Yangon Speciality Hospital) who kindly allowed us to conduct this study and gave us very useful information. A special appreciation must go to all hemodialysis patients and their family members.

REFERENCES

1. Hamer RA & Nahas AME. The burden of chronic kidney disease. *British Medical Journal* 2006; 332(7541): 563-564. Epub 2006 / 03/11. doi: 10.1136 / bmj.332. 7541.563. PMID:16528062; PMCID: PMCPMC 1397782.
2. Jha V, Garcia-Garcia G, Iseki K, Li Z, Naicker S, Plattner B, *et al.* Chronic kidney disease: Global dimension and perspectives. *Lancet* 2013; 382(9888): 260-272. Epub 2013/05/31. doi: 10.1016/s0140-6736(13) 60687-x. PMID: 23727169.
3. Schieppati A & Remuzzi G. Chronic renal diseases as a public health problem: Epidemiology, social, and economic implications. *Kidney International Supplement* 2005; 98: S7-s10. Epub 2005/08/20. doi: 10.1111/ j.1523-1755.2005.09801.x.PMID: 16108976.
4. Honeycutt AA, Segel JE, Zhuo X, Hoerger TJ, Imai K & Williams D. Medical costs of CKD in the Medicare population. *Journal of the American Society of Nephrology* 2013; 24(9): 1478-83. Epub 2013/ 08/03. doi: 10.1681 / ASN. 2012040392. PMID: 23907508; PMCID: PMC3752941.
5. Lozano R, Naghavi M, Foreman K, Lim S, Shibuya K, Aboyans V, *et al.* Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: A systematic analysis for the Global Burden of Disease Study 2010. *Lancet* 2012; 380(9859): 2095-128. Epub 2012/12 / 19. doi: 10.1016 / s0140-6736 (12)61728-0. PMID: 23245604.
6. World Bank. Chronic Kidney Disease in Myanmar Statistics on Overall Impact an Specific Effect on Demographic Groups. World Bank: World Development Indicators. CIA World Fact Book; 2016 [Internet]. Available from: [http://global-disease-burden.healthgrove. Com /1 / 67090 / Chronic-Kidney-Disease-in-Myanmar](http://global-disease-burden.healthgrove.Com/1/67090/Chronic-Kidney-Disease-in-Myanmar).
7. Essue BM, Wong G, Chapman J, Li Q & Jan S. How are patients managing with the costs of care for chronic kidney disease in Australia? A cross-sectional study. *BioMed Central Nephrology* 2013; 14:5. Epub 2013/01/12. doi: 10.1186/1471-2369-14-5. PMID: 23305212; PMCID: PMC 3698195.
8. Vupputuri S, Kimes TM, Calloway MO, Christian JB, Bruhn D, Martin AA, *et al.* The economic burden of progressive chronic

- kidney disease among patients with type 2 diabetes. *Journal of Diabetes and Its Complications* 2014; 28(1): 10-16. Epub 2013/11/12. doi: 10.1016 /j.jdiacomp. 2013.09.014. PMID: 24211091.
9. Mani MK. The management of end-stage renal disease in India. *Artificial Organs* 1998; 22(3): 182-186. Epub 1998/04/04, doi: 10.1046/j. 1525-1594. 1998.06070.x. PMID: 9527276.
 10. Jha V. End-stage renal care in developing countries: The India experience. *Renal Failure* 2004; 26(3): 201-208. Epub 2004/09/10. doi: 10.1081/jdi-120039516. PMID: 15354966.2
 11. Jha V. Current status of chronic kidney disease care in southeast Asia. *Seminars in Nephrology* 2009; 29(5): 487-496. Epub 2009/09/16. doi: 10.1016/j. semnephrol. 2009.06.005. PMID: 19751894.
 12. Kher V. End-stage renal disease in developing countries. *Kidney International* 2002; 62(1): 350-62. Epub 2002/06/26. doi:10.1046 /j.1523-1755.2002.00426. x. PMID:12081600.
 13. Mushi L, Marschall P & Fleßa S. The cost of dialysis in low and middle-income countries: A systematic review. *BioMed Central Health Services Research*. 2015; 15: 506. Epub 2015 / 11/ 14. doi: 10.1186 / s12913-015-1166-8. PMID: 26563300; PMCID: PMC4642658.
 14. Khaing IK, Malik A, Oo M & Hamajima N. Healthcare expenditure of households in Magway, Myanmar. *Nagoya Journal of Medical Science* 2015; 77(1-2): 203-212. Epub 2015/03/24. PMID: 25797985; PMCID: PMC4361522.
 15. Daniel WW & Cross CL. Biostatistics: A foundation for Analysis in the Health Sciences. 10th Ed. 2013. Hoboken.
 16. Suja A, Anju R, Anju V, Neethu J, Peeyush P & Saraswathy R. Economic evaluation of end stage renal disease patients undergoing hemodialysis. *Journal of Pharmacy & Bio-allied Sciences* 2012; 4(2): 107-111. Epub 2012/05/05. doi: 10.4103/ 0975-7406.94810. PMID: 22557920; PMCID: PMC3341713.
 17. Senanayake SJJ, Gunawardena NS, Palihawadana P, Bandara S, Bandara P, Ranasinghe AU, *et al.* Out-of-pocket expenditure in accessing healthcare services among Chronic Kidney Disease patients in Anuradhapura District. *The Ceylon Medical Journal* 2017; 62(2): 100-3. Epub 2017/07 /13. doi: 10.4038/ cmj.v62i2.8475. PMID: 28697592.
 18. de Francisco AL, De la Cruz JJ, Cases A, de la Figuera M, Egocheaga MI, Górriz JI, *et al.* Prevalence of kidney insufficiency in primary care population in Spain: ROCAP study. *Nefrologia* 2007; 27(3): 300-312. Epub 2007/08/30. PMID: 17725449.