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RESEARCH ARTICLE

The HUGE Formula as a method for diagnosis of Chronic Kidney disease in elderly patients assisted at a public and Teaching Hospital in Maringá, Paraná, Brazil.

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ABSTRACT

Renal function was generally determined using the Cockcroft-Gault equation and to estimate the calculated dose adjustments. However, many errors in renal function have been observed in elderly patients, mainly due to altered levels of creatinine that could influence the prescription of medications. A comparative study was performed for the diagnosis of chronic kidney disease (CKD) using the HUGE and COCKCROFT-GAULT prediction methods performed with patients assisted at a public tertiary and teaching hospital in Paraná, Brazil. We retrospectively analyzed clinical data from 123 medical records of elderly patients, from September 2016 to January 2017. The data showed a concordance of the individual methods analyzed among the diagnostic methods used in all patients. The results showed that HUGE equation was more accurate, confirming the diagnosis for all renal patients, especially for positive predictive values of renal disease in relation to COCKCROFT-GAULT method.

Keywords: Elderly; Chronic kidney Disease; Cockcroft-Gault; HUGE equation

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INTRODUCTION

Renal dysfunction is commonly associated with other diseases, such as diabetes and heart failure and also with patient morbidity and mortality.

The kidney function has usually been determined using the COCKCROFT-GAULT equation, considering the spectrum of creatinine or estimated glomerular filtration rate (GFR)[1]. Errors could be found on evaluation of renal function, such altered creatinine levels in elderly patients, since a decrease in GFR could be secondary associated with the aging process [2]. In spite of GFR is the best method to determine the degree of renal function, methods used to estimate glomerular filtration in the elderly have not been validated in this population.

Chronic kidney disease (CKD) is considered to be the presence of a GFR less than 60 ml/min and recently, the use of HUGE formula has been proposed and validated as a method for diagnosing the CKD (or its absence) based on hematocrit, plasmatic and seric urea levels and gender and not considering GRF value [3-6].

In this work we evaluated the performance of the HUGE equation in renal elderly patients assisted at a public tertiary and teaching hospital in Maringá, Paraná, Brazil.

MATERIALS AND METHODS

This work reports a comparative study for diagnosis of CKD using the predict HUGE and COCKCROFT-GAULT methods and was conducted at the Hospital of the State University of Maringá, a tertiary and teaching public hospital in Paraná, Brazil. A descriptive and retrospective study of medical records and patient management notes of 123 patients under or over 70 years. Clinical data from patients, from September 2016 to January 2017, were collected. The software R version 3.5.0 was used for data management and statistical analysis [7]. Thus, statistical methods used in the analysis could discriminate or not to prove the diagnosis of CKD. Test for diagnosis generally used in clinical. The sensitivity and specificity of the methods were also compared. A 0.05 significance level was used for all statistical tests.

The study protocol was approved by the Research Ethics Committee of the State University of Maringá, CAAE: 57860116.0.0000.0104.

RESULTS AND DISCUSSION

Data from medical records of 123 patients under or over 70 years were evaluated and presented in Table 1.

From the sample using HUGE method, of the NCKD observed data, 72 (58.54%) were included as predicted NCKD whereas in 10 patients (8.13%) as predicted CDK. The results obtained from the CDK observed group showed that 14 (11.38%) were included in NCKD and 27 (21.95%) in CDK predict groups, respectively. Otherwise, in CDK observed group 14 (11.38%) were in NCKD and 27 (21.95%), respectively ($p=0.5403$). The results obtained with predicted COCKCROFT-GAULT method showed that for NDCK observed, 45 (36.59%) were included as predicted NCKD and for 37 patients (30.08%) as predicted CDK. For those where CDK was observed 4 (3.25%) were included in NCKD and 37 (38.08%) in CDK predict groups, respectively ($p=0.0000$).

Data showed a concordance of individual methods analyzed by the McNemar's test for pairwise comparisons between diagnostic methods used in all patients (Table 1). The HUGE method ($p=0.5403$) showed more accuracy, confirming the diagnosis for all renal patients, mainly for positive predictive values of renal disease (Table 2). Our results evaluating accuracy of HUGE equation are similar to that observed in other study in elderly patients [8].



Table 1: Comparison between predicting HUGE and COCKCROFT-GAULT methods for diagnosis of chronic kidney disease

Whole sample		Predicted CDK HUGE		Predicted CDK COCKCROFT-GAULT	
		NCKD	CKD	NCKD	CKD
n=123					
OBSERVED	NCKD	72(58.54)	10(8.13)	45(36.59)	37(30.08)
	CKD	14(11.38)	27(21.95)	4(3.25)	37(30.08)
McNemar		p=0.5403		p<0.0000	
Chi-Square of Pearson		p<0.0000		p<0.0000	
< 70 years		Predicted CRI HUGE		Predicted COCKCROFT-GAULT	
(n=42)		NCKD	CKD	NCKD	CKD
OBSERVED	NCKD	28(66.67)	1(2.38)	21(50.00)	8(19.05)
	CKD	6(14.29)	7(16.67)	3(7.14)	10(23.81)
McNemar		p=0.1306		p=0.2278	
Chi-Square of Pearson		p=0.0001		p=0.0024	
≥ 70 years		Predict CKD HUGE		Predicted COCKCROFT-GAULT	
n=81		NCKD	CKD	NCKD	CKD
OBSERVED	NCKD	44(54.32)	9(11.11)	24(29.63)	29(35.80)
	CKD	8(9.88)	20(24.69)	1(1.23)	27(33.33)
McNemar		p=0.9987		P<0.0000	
Chi-Square of Pearson		p<0.0000		p=0.00016	

CKD: chronic kidney disease; NCKD: non chronic kidney disease

Table 2: Comparison of accuracy methods for CKD diagnosis.

Whole sample	Sensitivity	Specificity	PPV	NPV
HUGE	0.6585	0.8780	0.7297	0.8372
COCKCROFT-GAULT	0.9024	0.5488	0.5000	0.9184
< 70 years				
HUGE	0.5385	0.9655	0.8750	0.8235
COCKCROFT-GAULT	0.7692	0.7241	0.5556	0.8750
≥ 70 years				
HUGE	0.7143	0.8302	0.6897	0.8462
COCKCROFT-GAULT	0.9643	0.4528	0.4821	0.9600

PPV: positive predictive value; NPV: negative predictive value

The performance of the HUGE equation to classified NCKD patients as healthy renal people was effective since it detects 58.54% of them when compared to 36.59% using COCKCROFT-GAULT method. The results of this study reveal the need for improving the specificity of diagnostic methods since the variability of the population, clinical conditions of the patients could affect parameters of sensitivity and specificity of diagnostic method. Patients with CKD need dose adjustment, since pharmacokinetics parameters are altered in renal disease, according to comorbidities, drugs prescription, avoiding possible drugs interactions and adverse reaction. Thus, a diagnosis of CKD in elderly people should be taken with care since for this specific group of patients, aging could be responsible for the reduced GFR index.

CONCLUSION

In conclusion, the HUGE method was more accurate, confirming the diagnosis for all renal patients, especially for positive predictive values of renal disease in relation to the COCKCROFT-GAULT method.

Conflicts of interest

The authors declare no conflict of interest with regards to this study.



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REFERENCES

- [1] Dowling TC, Wang ES, Ferrucci L, Sorkin JD. *Pharmacother* 2013; 33: 912-21.
- [2] Musso CG, Macías Nuñez JF, Oreopoulos DG. *J Nephrol* 2007; 20(5):586–587.
- [3] Robles NR, Felix FJ, Lozano L, Miranda I, Frenandez-Berges D, Macías JF. *J Nutr Health Aging* 2015; 19(6):688–692.
- [4] Alvarez-Gregori JÁ, Robles NR, Mena C, Ardanuy R, Macias-Nuñez JF. *J Nutr Health Aging* 2011; 15: 480-484.
- [5] Robles NR, Felix FJ, Fernandez-Berges D, Perez-Castán J, Zaro MJ, Lozano L et al. *Eu Rev Med Pharmacol Sci* 2013; 17: 1889-93.
- [6] Heras M, Fernández-Reyes MJ, Guerrero MT, Sánchez R. *Rev Esp Geriatr Gerontol* 2013; 48(2):94-5.
- [7] R Core Team (2018). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL <https://www.R-project.org/>.
- [8] Musso CG, de los Rios E, Vilas M, Terrasa S, Bratti G, Varela F, Diez GR, Jauregui J, Luna D. *Int Urol Nephrol* 2017; 49, 677–680.
- [9] Heras M, Fernández-Reyes MJ, Guerrero MT, Sánchez R. *Rev Esp Geriatr Gerontol* 2013; 48(2):94-5.