

m-NUTRIC Score for Assessment of Nutritional Status and Treatment Outcomes in Chronic Kidney Disease Patients

Abstract

Background: Malnutrition entails insufficiency arising of protein, vitamin, trace elements related to inadequate & unstable diet which may cause poor quality of life and sometimes even lead to death. Undernourishment is the leading reason having greater impact on outcomes following treatment, which lengthens patient stay and impacts mortality and morbidity. Protein deficiency is commonly reported among chronic kidney disease (CKD) patients. Lack of proper nutrition affects quality of life of patients with chronic kidney disease. Nutritional problems among CKD subjects needs to be detected earlier. This study aims to assess the nutritional risk of patients with CKD by m-Nutric score and compare the m-Nutric scores among patients with and without haemodialysis.

Material and Method: This will be a cross sectional study in the Dept. of Medicine, at AVBRH, Wardha. Total 150 patients with CKD reporting to Medicine Department, AVBRH, Wardha will be enrolled in the study. m-NUTRIC score will be calculated as per the criteria. APACHE II at admittance and Sequential Organ Failure Assessment (SOFA) score will be assessed. NUTRIC points will be calculated without interleukin (IL)-6. Morbidity data, duration of stay of patients and mortality will be recorded.

Expected Results: Subjects having m-NUTRIC scores more than or equal to five will be graded in high risk category of undernourishment whereas scores less than or equal to four will be categorised as low risk. We expect a significant correlation of m-NUTRIC scores ≥ 5 to duration of hospitalisation and risk of death.

Conclusion: The m-NUTRIC scores would be directly correlated with mean ICU duration of stay and mortality for patients with hospitalised CKD.

Keywords: Malnutrition, Morbidity, Mortality, Chronic kidney disease, m-NUTRIC score, nutritional status, Haemodialysis,

Introduction:

Numerous apparatus are available to assess nutrition status among CKD subjects^{1,2}. Most of these apparatus are having different criteria and commonly designed for high risk patients^{3,4}. Due to these reasons, globally no apparatus has been declared as the best system available. The reasons for the lack of best system are their ways to use in numerous research.^{5,6}

Malnutrition entails insufficiency arising of protein, vitamin, trace elements related to inadequate & unstable diet which may cause poor quality of life and sometimes even lead to death. Undernourishment is the leading reason having greater impact on outcomes

Comment [AA1]: and trace

Comment [AA2]: and

Comment [AA3]: insert a

Comment [AA4]: remove extra space

Comment [AA5]: insert the

Comment [AA6]: assess

Comment [AA7]: remove extra space

Comment [AA8]: insert hyphen

Comment [AA9]: remove extra space

Comment [AA10]: insert the

Comment [AA11]: remove extra space

Comment [AA12]: the high-risk

Comment [AA13]: remove extra space

Comment [AA14]: insert the

Comment [AA15]: remove extra space

Comment [AA16]: explain your abbreviation, unless the journal do not recommend so

Comment [AA17]: The word apparatus may be used here improperly, you are using scoring system rather than equipment or sets, Is it better to change to nutritional status, consider this, Also I wonder if its proper to use the word subjects to describe patients? can you find better another word?

Comment [AA18]: Should your ref. Be separated by comma or dot?

Comment [AA19]: are commonly designed for high-risk

Comment [AA20]: re-consider word choice please

Comment [AA21]: the sentence seems unclear, clarify it or consider removing it please

Comment [AA22]: end your sentence after mentioning your references

Comment [AA23]: and trace

Comment [AA24]: and

Comment [AA25]: unsuitable or unstable?

Comment [AA26]: insert a

following treatment, which lengthens patient stay and impacts mortality and morbidity. In hospitalised patients, the incidence of undernourishment is approximately **twenty percent-forty two percent**⁶. Therefore by evaluating CKD subject's nutritious status within **forty eight** hrs of hospitalisation, it becomes important to recognise the **subjects** who are having chances of suffering from undernourishment. Various rating schemes, standards and methods are used in the hospital setting to determine nutritional risk, including physical evaluation, food consumption, disease severity, functional assessment, and anthropometric data.

Currently limited very defined apparatus are available to diagnose hospitalisation, impact as well as side effects among the patients.⁷ Heyland et al.⁸ was the **1st** one who validated m-NUTRIC score to assess undernourishment in Europe. The main function of this apparatus was to analyse undernourishment among CKD subjects. The advantage of this tool is its ease to understand along with its simplicity for the analysis in undernourished subjects. Recently this system has been modified i.e. modified mNUTRIC score in which **Interleukin-6 (IL-6) factor** was not included.⁹

Among the comprehensive treatment of Chronic kidney disease subjects, **dietary remedy should n't** be neglected. Before the initiation of treatment in CKD subjects, **dietary factors must be** assessed. **Incidence of undernourishment among CKD ranges among the studies due to different use of diagnostic tools i.e. incidence ranges from twenty to sixty percent.** This undernourishment leads to **increase in treatment cost along with the prolonged** hospitalisation.¹⁰⁻¹¹ Protein deficiency and lack of sufficient energy and chances of undernourishment are generally reported among CKD subjects.¹²

An observational research was performed in 2018 by Hafiz Muhammad Ata ur-Rhmanet al.¹³ to classify nutritional risk using **modified mNUTRIC** score in mechanically ventilated subjects. The investigators concluded that **45 percent** of mechanically ventilated subjects in ICU are at risk of undernourishment and their mNUTRIC scores are directly proportional to prolonged hospitalisation & death.

Martin Muller et al.¹⁴ in 2019 evaluated Nutrition Risk Screening Score 2002 (NRS) analysis among CKD admitted subjects. According to NRS>3, the authors concluded that malnutrition in among CKD subjects is **noteworthy more** and therefore directly proportional to prolonged hospitalisation & death.

In their analysis, Kalaiselvan MS et al¹⁵ found that **there was dominance of males i.e. sixty seven percent.** Average age among the study subjects was **fifty five** years. There were about 288 (**42.5 percent**) high nutrient risk patients. Subjects **having high mNUTRIC range of > five** have a longer mean average ICU period of stay of **nine vs seven point eight** (P < 0.01) & greater death rate of **forty one point four percent vs twenty six point one percent** versus subjects having **lower NUTRIC range.** The strong **mNUTRIC score (almost 5)** expected mortality with a ROC of 0.582. The investigators concluded that approximately **forty two point five subjects** in ICU were having chances of undernourishment which subsequently cause higher ICU stay as well as death and these findings were directly proportional to higher mNUTRIC score.

However **rare literature** regarding the validity of mNUTRIC score is validated among **Indian population.** Sometimes lack of proper nutrition may lead to poor quality of life among CKD **subjects due to which it is need of hour to diagnose nutritional problems among**

- Comment [AA27]: Usual article ...
- Comment [AA28]: Reconsider word ...
- Comment [AA29]: 48
- Comment [AA30]: Re-write your ...
- Comment [AA31]: first
- Comment [AA32]: reconsider word ...
- Comment [AA33]: reconsider word ...
- Comment [AA34]: reconsider word ...
- Comment [AA35]: reconsider word ...
- Comment [AA36]: insert hyphen
- Comment [AA37]: you have previou ...
- Comment [AA38]: reconsider word ...
- Comment [AA39]: you can either ...
- Comment [AA40]: write should not
- Comment [AA41]: reconsider word ...
- Comment [AA42]: remove extra space
- Comment [AA43]: reconsider word ...
- Comment [AA44]: an increase in ...
- Comment [AA45]: mention your ref ...
- Comment [AA46]: replace and with ...
- Comment [AA47]: same as before
- Comment [AA48]: remove an
- Comment [AA49]: the modified m- ...
- Comment [AA50]: same as before
- Comment [AA51]: 45%
- Comment [AA52]: Same as before
- Comment [AA53]: Same as before
- Comment [AA54]: and
- Comment [AA55]: same as before
- Comment [AA56]: remove in
- Comment [AA57]: improper words ...
- Comment [AA58]: and
- Comment [AA59]: insert dot
- Comment [AA60]: a dominance
- Comment [AA61]: male dominance ...
- Comment [AA62]: 67%
- Comment [AA63]: The average
- Comment [AA64]: Same as before
- Comment [AA65]: 55
- Comment [AA66]: 55
- Comment [AA67]: 42.5%
- Comment [AA68]: Same as before
- Comment [AA69]: Insert hyphen
- Comment [AA70]: and
- Comment [AA71]: 41.4% versus 6.1%
- Comment [AA72]: Try to clarify you ...
- Comment [AA73]: a lower
- Comment [AA74]: m-NUTRIC
- Comment [AA75]: m-NUTRIC score ...
- Comment [AA76]: explain ROC
- Comment [AA77]: 42.5 patients
- Comment [AA78]: m-NUTRIC
- Comment [AA79]: insert comma
- Comment [AA80]: the m-NUTRIC
- ...

CKD subjects. In our study, we will try to assess the role of by m-NUTRIC Score in CKD subjects.

Comment [AA83]: remove by

Comment [AA84]: same as before

CKD is a major public health concern in India, with its high prevalence, morbidity and mortality. Suboptimal results have arisen from significant percentages of subjects with poor socioeconomic status etc as well as poor management of health resources. In addition, among the various ongoing problems & rivalry for funding w.r.t. transmissible disorders, CKD has also been overlooked.¹ Consanguinity and genetic inbreeding raise the risk of kidney & genital organ's congenital defects as well as obstructive or reflux nephropathy. Glomerular and interstitial kidney diseases may arise from pollution, inadequate hygiene, contaminants, water pollution, overcrowding, and known and suspected nephrotoxins. The rising burden of hypertension and diabetes mellitus is included in these exposures. By 2030, diabetes subjects in our country will be the most as compared to other countries worldwide. About 50 percent of patients with progressive chronic kidney failure are only seen when the eGFR is <15 ml/min³ leading to difficulties in access to treatment. Hence it is the utmost requirement to diagnose the subjects at risk for CKD.

Comment [AA85]: and

Comment [AA86]: explain this abbreviation

Comment [AA87]: and

Comment [AA88]: organs'

Comment [AA89]: same as before

Background/Rationale

This study has been designed with a view to illustrate modified NUTRIC score pattern in the population of patients to assess the nutritional status and to characterize nutritional behavior in CKD patients.

Comment [AA90]: insert hyphen

Comment [AA91]: behaviour

Objectives:

- To assess nutrition among CKD subjects w.r.t stage by m-Nutric score.
- To define outcome on the basis of m-NUTRIC score in terms of need of dialysis.
- To compare m-Nutric score in patients on hemodialysis and patients not on hemodialysis.

Comment [AA92]: NUTRIC

Comment [AA93]: NUTRIC

Methods:

This research will be conducted in the Department of Medicine, at AVBRH, Sawangi (Meghe) Wardha. The study will be undertaken after approval from institute of ethical committee (applied for).

Comment [AA94]: was conducted

Comment [AA95]: Remove extra space

Comment [AA96]: Was undertaken

Comment [AA97]: The institute of the ethical committee

Study design: Cross sectional study

Selection of patients

Patients: We will prospectively enrol all consecutive patients > 18 years of age regardless of gender or ethnicity who will be admitted in the medicine ward for Chronic kidney disease treatment at AVBRH, Sawangi. Written informed consent will be obtained from all participants.

Comment [AA98]: Replace with have or had

Comment [AA99]: chronic

Comment [AA100]: was

Inclusion criteria: All Chronic kidney disease patients with age more than 18 years, undergoing treatment in Medicine Department at AVBRH, Sawangi who have given written consent will be recruited.

Comment [AA101]: were

Exclusion criteria: Patients <18 years of age, chronic liver disease, CCF, Malignancy, tuberculosis, patients who will be difficult to cooperate with, and pregnant or breastfeeding patients will not be considered for our research.

Comment [AA102]: explain this abbreviation

METHODS

Demographic data: Demographic data would be registered for both instances (age, sex, operation). Where available, height will be recorded with the help of stadiometer. The weight can be determined by weighing the weight of the bed. Height and weight can be used for assessing the index of body mass.

Comment [AA103]: insert a

Assessment of biochemical parameters: These comprised of CBC, total serum protein, albumin, LFT, blood urea nitrogen (BUN), creatinine, and electrolyte measurements.¹⁶ these parameters will be assessed according to their reference and will be compared.¹⁷

a) **m-NUTRIC score:** It will be calculated as per the criteria. APACHE II at admittance¹⁸ and Sequential Organ Failure Assessment (SOFA) score will be assessed too.¹⁹ NUTRIC points will be calculated without interleukin (IL)-6. Subjects having mNUTRIC scores more than equal to five will be graded in high risk category of undernourishment whereas scores less than equal to four will be categorised as low risk. Morbidity data, duration of stay of patients and mortality will be recorded (table 1).

Comment [AA104]: m-NUTRIC

Comment [AA105]: insert hyphen

Comment [AA106]: insert the

mNUTRIC Score; Table - 1

Variable	Range	Score
Age	Less than fifty	0
	Fifty to Less than seventy five	1
	More than seventy five	2
APACHE II	Less than Fifteen	0
	Fifteen to Less than Twenty	1
	Twenty to Twenty Eight	2
	More than Twenty Eight	3
SOFA	Less than Six	0
	Six to Less than Ten	1
	More than Ten	2
Number of Co-morbidities	Zero to one	0
	More than Two	1

Days from hospital to ICU admission	Zero to Less than One	0
	More than One	1

Sample size and statistical analysis:

In testing terminology, a sample is a group of entities, objects or things for evaluation taken from a wider population. To ensure that we can generalise the results from the test study to the population as a whole the survey should be representative of the population.

Sample size formula with designed error of margin:

$$n = (Z \alpha/2 \text{ square} \times P (1-P))/d \text{ square}$$

Where, Z alpha/2 is the level of significance at 5% =1.96

P= Prevalence of CKD=10%

So minimum sample size required will be 138 patients.

In this study, I plan to take minimum sample size of 150 patients.

The data obtained will be analysed by IBM, SPSS (IBM Corp., Statistics for Windows, version 24.0, Armonk, NY). Continuous variables would be expressed as a percentage of mean ± standard deviation (SD) and categorical variables. Unpaired sample t-tests will be used to find the statistical difference between the bivariate samples of independent categories, and Chi-square tests will be used to evaluate the meaning of categorical results. P less than equal 0.05 would be called statistically important in all of the mathematical instruments referred to above.

Expected Outcomes/Results

We expect from our results that malnutrition in CKD patients with m-NUTRIC scores ≥5, will be directly proportional to hospitalisation and death.

Discussion:

CKD is a major public health concern in India, with its high prevalence, morbidity and mortality. Most of the subjects with poor socioeconomic status, weak gross domestic product, and inadequate monetary health care budgets have achieved suboptimal outcomes. Furthermore, CKD has also been neglected in the light of ongoing challenges and competition for support for communicable diseases and increased child and maternal mortality. CKD patients are especially susceptible to malnutrition's deleterious effects, while malnutrition is frequently not known. Previous studies have found that a large percentage of hospitalised patients have been identified as malnourished^{20,21}. Similarly, malnutrition was also extremely prevalent (40 percent) in a recent study of hospitalised CKD patients, impacting the duration of hospitalisation, while mortality was not explored²².

It is important to remember that renal dietary limits often contradict standard nutritional guidelines, and even though complications can be prevented by restricting the consumption of salt, potassium, phosphates, and fluids, concerns emerge where such restrictions are not followed by guidance on alternate dietary options and methods to sustain sufficient nutrition. Very little data exists as to the benefits of dietary treatments in patients with CKD, while current multi-centered research can offer sufficient evidence to support such treatment strategies. It is well known that there is a high risk of malnutrition in ICU patients. Malnutrition is linked with adverse effects and multiple interventional trials have been undertaken to identify effective nutrition interventions for these patients²³.

Comment [AA107]: insert the

Comment [AA108]: remove comma

Comment [AA109]: insert the

Comment [AA110]: study,

Comment [AA111]: insert a

Comment [AA112]: remove equal

Comment [AA113]: I expect that you have performed your study but seems like it's a project? Confusing a little, otherwise where is your results

Comment [AA114]: centred

Heyland et al⁸ started by recognising the need for a more precise nutritional risk assessment method for ICU patients, and found that it was inadequate to ask about weight loss and nutritional situation, especially because of the heterogeneous nature of the intensive care community, and because the NUTRIC score is simple to use, they said it was an effective screening tool for this patient. They also found that patients have poorer health results with a higher score. Increased knowledge of diet risk assessment devices, such as the NUTRIC score, was considered, and risk factors, such as BMI and length of ICU stay, could increase the supply of calories and protein to those patients who most need them. Coltman et al²⁴ found that conventional screening and evaluation methods did not uniformly classify patients in the ICU as malnourished or at risk of nutrition and could therefore be inadequate for use in patients with ICUs. Inclusion of physical examination, functional status, and disease severity can be helpful in the ICU's prediction of nutrition risk. Studies on nutrition were reviewed²⁵⁻²⁸. Different studies on chronic kidney diseases and patient care were reported²⁹⁻³⁸.

Comment [AA115]: m-NUTRIC

Comment [AA116]: m-NUTRIC

Several reports have indicated that understanding of nutritional status & undernourishment care is frequently lacking and that the problem lies in the introduction of effective screening methods to provide accurate nutritional assessment and help.

Comment [AA117]: the

Conclusion:

To conclude, the mNUTRIC scores would be directly correlated with mean ICU duration of stay and mortality for patients with hospitalised CKD. Since CKD patients constitute a high-risk demographic for adverse effects associated with malnutrition, regular assessment of hospital admission nutritional status should become a systematic procedure.

Comment [AA118]: insert hyphen

REFERENCES:

1. Abraham G, Varughese S, Thandavan T, et al. Chronic kidney disease hotspots in developing countries in South Asia. *Clin Kidney J* 2016;9:135–141.
2. Rajagopalan P, Abraham G, Reddy YN, Lakshmanasami R, Prakash ML, Reddy YN. Population-based estimation of renal function in healthy young Indian adults based on body mass index and sex correlating renal volume, serum creatinine and cystatin C. *Int J NephrolRenovasc Dis* 2016;9:243–247.
3. Varughese S, John GT, Alexander S, et al. Pre-tertiary hospital care of patients with chronic kidney disease in India. *Indian J Med Res* 2007;126:28–33.
4. Fassett RG. Current and emerging treatment options for the elderly patient with chronic kidney disease. *Clinical interventions in aging*. 2014; 9:191–9.
5. Kumar S, Agrawal S, Lahoti S. All study of carotid intimal medial thickness in chronic kidney disease at rural teaching hospital. *Ann Med Health Sci Res* 2017;7:76-80
6. Banks M, Bauer J, Gaskill D. Prevalence of malnutrition in adults in Queensland public hospitals and residential aged care facilities. *Nutr Diet* 2007;63:172–8..
7. Fouque D, Kalantar-Zadeh K, Kopple J, et al. A proposed nomenclature and diagnostic criteria for protein-energy wasting in acute and chronic kidney disease. *Kidney international*. 2008; 73(4):391–8.
8. Heyland DK, Dhaliwal R, Jiang X, et al. Identifying critically ill patients who benefit the most from nutrition therapy: the development and initial validation of a novel risk assessment tool. *Crit Care* 2011;15:R268.

Comment [AA119]: have you mentioned DOI/links to all your references? Please do so

9. Kruizenga H, Seidell J, De Vet H, et al. Development and validation of a hospital screening tool for malnutrition: the Short Nutritional Assessment Questionnaire (SNAQ). *Clin Nutr* 2005;24:75–82.
10. Guigoz Y, Vellas B, Garry PJ. Assessing the nutritional status of the elderly: the Mini Nutritional Assessment as part of the geriatric evaluation. *Nutr Rev* 1996;54:S59–65.
11. Marian AE, van Bokhorst-de van der Schueren ,PatríciaRealinoGwaitoli, et al. Nutrition screening tools: does one size fit all? A systematic review of screening tools for the hospital setting. *Clin Nutr* 2014;33:39–58.
12. Klein S, Kinney J, Jeejeebhoy K, et al. Nutrition support in clinical practice: review of published data and recommendations for future research directions. Summary of a conference sponsored by the National Institutes of Health, American Society for Parenteral and Enteral Nutrition, and American Society for Clinical Nutrition. *Am J Clin Nutr* 1997;66:683–706.
13. Rahman A, Hasan RM, Agarwala R, Martin C, Day AG, Heyland DK. Identifying critically-ill patients who will benefit most from nutritional therapy: further validation of the "modified NUTRIC" nutritional risk assessment tool. *Clin Nutr* 2016;35(1):158-62.
14. Ata Ur-Rehman H, Ishtiaq W, Yousaf M, et al. Modified Nutrition Risk in Critically Ill (mNUTRIC) Score to Assess Nutritional Risk in Mechanically Ventilated Patients: A Prospective Observational Study from the Pakistani Population. *Cureus* 2018;10(12): e3786.
15. Kalaiselvan MS, Renuka MK, Arunkumar AS. Use of nutrition risk in critically ill (NUTRIC) score to assess nutritional risk in mechanically ventilated patients: A prospective observational study. *Indian J Crit Care Med* 2017;21:253-6.
16. Müller M, Dahdal S, Saffarini M, Uehlinger D, Arampatzis S. Evaluation of Nutrition Risk Screening Score 2002 (NRS) assessment in hospitalized chronic kidney disease patient. *PloS one*. 2019;14(1):e0211200.
17. Acharya S. Prevalance of depression among patients with chronic kidney disease. *Journal of Dental and Medical Science* 2014;13:19-22.
18. Kumar S, Joshi R, Joge V. Do clinical symptoms and signs predict reduced renal function among hospitalized adults? *Ann Med Health Sci Res* 2013;3:492-7.
19. vanManen JG, Korevaar JC, Dekker FW, et al. How to adjust for comorbidity in survival studies in ESRD patients: a comparison of different indices. *Am J Kidney Dis* 2002;40:82–9.
20. Imoberdorf R, Meier R, Krebs P, Hangartner PJ, Hess B, Staubli M, et al. Prevalence of undernutrition on admission to Swiss hospitals. *Clinical nutrition (Edinburgh, Scotland)*. 2010; 29(1):38–41.
21. Rasmussen HH, Kondrup J, Staun M, Ladefoged K, Kristensen H, Wengler A. Prevalence of patients at nutritional risk in Danish hospitals. *Clinical nutrition (Edinburgh, Scotland)*. 2004; 23(5):1009–15.
22. Borek P, Chmielewski M, Malgorzewicz S, DebskaSlizien A. Analysis of Outcomes of the NRS 2002 in Patients Hospitalized in Nephrology Wards. *Nutrients*. 2017; 9(3).
23. Carrero JJ, Stenvinkel P, Cuppari L, et al. Etiology of the protein-energy wasting syndrome in chronic kidney disease: a consensus statement from the International Society of Renal Nutrition and Metabolism (ISRNM). *Journal of renal nutrition: the official journal of the Council on Renal Nutrition of the National Kidney Foundation*. 2013; 23(2):77–90.

24. Coltman A, Peterson S, Roehl K, et al. Use of 3 tools to assess nutrition risk in the intensive care unit. *JPEN J Parenter Enteral Nutr* 2015;39:28–33.
25. Jawaharani, A., S. Acharya, S. Kumar, A. Gadegone, and N. Raisinghani. "The Effect of Music Therapy in Critically Ill Patients Admitted to the Intensive Care Unit of a Tertiary Care Center." *Journal of Datta Meghe Institute of Medical Sciences University* 14, no. 4 (2019): 320–25. <https://doi.org/10.4103/jdmimsu.jdmimsu.41.20>.
26. Khatib MN, Gaidhane A, Gaidhane S, Quazi ZS. Ghrelin as a promising therapeutic option for cancer cachexia. *Cellular Physiology and Biochemistry*. 2018;48(5):2172–88. <https://doi.org/10.1159/000492559>
27. Parameshwar Reddy, V., R.J. Meshram, and S.S. Chaudhari. "Fluid Balance in Critically Ill Children Admitted in Picu." *International Journal of Pharmaceutical Research* 11, no. 3 (2019): 1449–53. <https://doi.org/10.31838/ijpr/2019.11.03.160>.
28. Uddin, S., H. Mahmood, U. Senarath, Q. Zahiruddin, S. Karn, S. Rasheed, and M. Dibley. "Analysis of Stakeholders Networks of Infant and Young Child Nutrition Programmes in Sri Lanka, India, Nepal, Bangladesh and Pakistan." *BMC Public Health* 17 (2017). <https://doi.org/10.1186/s12889-017-4337-1>.
29. Goswami, J., M.R. Balwani, V. Kute, M. Gumber, M. Patel, and U. Godhani. "Scoring Systems and Outcome of Chronic Kidney Disease Patients Admitted in Intensive Care Units." *Saudi Journal of Kidney Diseases and Transplantation : An Official Publication of the Saudi Center for Organ Transplantation, Saudi Arabia* 29, no. 2 (2018): 310–17. <https://doi.org/10.4103/1319-2442.229268>.
30. Prasad, N., M. Bhatt, S.K. Agarwal, H.S. Kohli, N. Gopalakrishnan, E. Fernando, M. Sahay, et al. "The Adverse Effect of COVID Pandemic on the Care of Patients With Kidney Diseases in India." *Kidney International Reports* 5, no. 9 (2020): 1545–50. <https://doi.org/10.1016/j.ekir.2020.06.034>.
31. Balwani, M.R., C.P. Bawankule, A. Pasari, P. Tolani, S. Vakil, and R. Yadav. "Minimal Change Disease and Kimura's Disease Responding to Tacrolimus Therapy." *Saudi Journal of Kidney Diseases and Transplantation : An Official Publication of the Saudi Center for Organ Transplantation, Saudi Arabia* 30, no. 1 (2019): 254–57. <https://doi.org/10.4103/1319-2442.252921>.
32. Balwani, M.R., A. Pasari, A. Meshram, A. Jawahirani, P. Tolani, H. Laharwani, and C. Bawankule. "An Initial Evaluation of Hypokalemia Turned out Distal Renal Tubular Acidosis Secondary to Parathyroid Adenoma." *Saudi Journal of Kidney Diseases and Transplantation : An Official Publication of the Saudi Center for Organ Transplantation, Saudi Arabia* 29, no. 5 (2018): 1216–19. <https://doi.org/10.4103/1319-2442.243965>.
33. Balwani, M.R., A. Pasari, and P. Tolani. "Widening Spectrum of Renal Involvement in Psoriasis: First Reported Case of C3 Glomerulonephritis in a Psoriatic Patient." *Saudi Journal of Kidney Diseases and Transplantation* 30, no. 1 (2019): 258–60. <https://doi.org/10.4103/1319-2442.252922>.
34. Nagrale AV, Glynn P, Joshi A, Ramteke G. The efficacy of an integrated neuromuscular inhibition technique on upper trapezius trigger points in subjects with non-specific neck pain: a randomized controlled trial. *Journal of Manual & Manipulative Therapy*. 2010 Mar 1;18(1):37-43.

35. Agrawal A, Cincu R, Goel A. Current concepts and controversies in the management of non-functioning giant pituitary macroadenomas. *Clinical neurology and neurosurgery*. 2007 Oct 1;109(8):645-50.
36. Franklin RC, Peden AE, Hamilton EB, Bisignano C, Castle CD, Dingels ZV, Hay SI, Liu Z, Mokdad AH, Roberts NL, Sylte DO. The burden of unintentional drowning: global, regional and national estimates of mortality from the Global Burden of Disease 2017 Study. *Injury prevention*. 2020 Oct 1;26(Supp 1):i83-95.
37. Chole RH, Gondivkar SM, Gadbail AR, Balsaraf S, Chaudhary S, Dhore SV, Ghonmode S, Balwani S, Mankar M, Tiwari M, Parikh RV. Review of drug treatment of oral submucous fibrosis. *Oral oncology*. 2012 May 1;48(5):393-8.
38. Korde SD, Basak A, Chaudhary M, Goyal M, Vagga A. Enhanced nitrosative and oxidative stress with decreased total antioxidant capacity in patients with oral precancer and oral squamous cell carcinoma. *Oncology*. 2011;80(5-6):382-9.

UNDER PEER REVIEW