Asian Journal of Research and Reports in Gastroenterology

Volume 7, Issue 1, Page 127-136, 2024; Article no.AJRRGA.117993

Managing Electrolyte Imbalances in Geriatric Patients with GI Disorders: Diagnostic Approaches, Treatment Strategies, and Clinical Outcomes

Subba. Dil [a*] and Rosy L. Tuolor [a]

[a] Sharda University School of Pharmacy, Greater Noida -201310, U.P, India.

Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

Article Information

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/117993

Minireview Article

Received: 06/04/2024
Accepted: 10/06/2024
Published: 25/06/2024

ABSTRACT

This Minireview article explores the critical role of electrolytes in geriatric gastric patients, emphasising their significance in managing gastrointestinal disorders. Elderly individuals are prone to electrolyte imbalances due to age-related physiological changes and the prevalence of gastric conditions. The review discusses the diagnostic methods, treatment strategies, and clinical outcomes associated with electrolyte disturbances in this population. Furthermore, it highlights the importance of interdisciplinary collaboration and personalised approaches in addressing electrolyte imbalances to improve patient outcomes.

Keywords: Geriatric patients; electrolytes; gastric disorders; diagnostic methods; treatment strategies; clinical outcomes; interdisciplinary collaboration; personalised approaches.

**Corresponding author: Email: dilprasadsubba60@gmail.com, dil.subba@sharda.ac.in;*

Cite as: *Dil, Subba., and Rosy L. Tuolor. 2024. "Managing Electrolyte Imbalances in Geriatric Patients With GI Disorders: Diagnostic Approaches, Treatment Strategies, and Clinical Outcomes". Asian Journal of Research and Reports in Gastroenterology 7 (1):127-36. https://journalajrrga.com/index.php/AJRRGA/article/view/141.*

1. INTRODUCTION

An overview of managing electrolyte imbalances plays a crucial role in managing gastric disorders in the geriatric population, with a prevalence of up to 10% in elderly patients [1]. The elderly are particularly vulnerable to fluid and electrolyte disturbances due to age-related physiological changes, emphasising the importance of monitoring and maintaining optimal hydration levels to prevent negative outcomes [2,3]. Electrolyte disturbances, such as hyponatremia, are common in the elderly and can significantly impact morbidity and mortality, especially in the context of neurologic injuries. Elderly individuals face a heightened risk of electrolyte imbalances due to age-related physiological changes, particularly in kidney function and homeostatic capabilities. These imbalances can lead to a range of complications, including cognitive deficits, gait instability, falls, fractures, and even increased mortality [3]. The geriatric population's susceptibility to disturbances in water and electrolyte balance underscores the importance of closely monitoring and maintaining healthy hydration levels, especially in the presence of concurrent illnesses and therapies [4]. Gastrointestinal disturbances, such as sodium and water losses, are common in the elderly, further exacerbating the risk of electrolyte disorders. Moreover, the elderly are at a higher risk of developing gastrointestinal disorders like reflux esophagitis, malabsorption issues, and inflammatory bowel disease, emphasising the need for improved clinical care in this population. Understanding these dynamics is crucial for enhancing the management and prevention of electrolyte imbalances and gastrointestinal conditions in older patients.

2. ELECTROLYTE IMBALANCE IN GERIATRIC GASTRIC PATIENTS

Electrolyte imbalances, particularly hyponatremia, are frequently observed in elderly patients undergoing gastrointestinal surgery [1]. Hyponatremia, characterized by low serum sodium levels below 135 mmol/L, can lead to a spectrum of symptoms ranging from lethargy to seizures, especially in the elderly population [5]. Studies emphasize the importance of early recognition and appropriate management of electrolyte disorders to prevent complications and reduce hospital readmissions. It can result from various causes such as excessive fluid intake, medication side effects, congestive heart failure, and the syndrome of inappropriate antidiuretic hormone secretion [6]. Electrolyte imbalance in geriatric gastric patients can indeed lead to a spectrum of symptoms, ranging from mild mental impairment to severe conditions like seizures. Research indicates that disturbances in water and electrolyte balance are common in older patients, with hyponatremia being, electrolyte imbalances, especially hypocalcaemia and hypokalaemia, are frequently observed in patients undergoing gastrointestinal surgery, emphasizing the importance of timely recognition and intervention to prevent complications [7]. Hypokalaemia and hypocalcaemia are also frequently observed in this patient population [8,9]. Factors like comorbidities, drug use, and gender contribute to the risk of hypokalaemia in the elderly [10]. Electrolyte disturbances can lead to prolonged hospital stays, increased costs, and higher mortality rates. In surgical settings, using balanced electrolyte solutions like Hartmann's solution can prevent metabolic acidosis and improve organ perfusion compared to saline-based fluids in elderly patients. Hartmann's solution refers to the utilization of Hartmann wavefront sensors in various scientific applications. In the context of fluid resuscitation post-cardiac surgery, a study compared the safety and efficacy of using Hartmann's solution as a predominant resuscitation fluid over HAS, showing that Hartmann's solution can safely replace HAS, leading to potential cost-effectiveness and shorter PICU stays [11]. As we recognizing and managing electrolyte imbalances in geriatric gastric patients, especially during surgery, is crucial for better outcomes and reduced complications. Gastric disorders commonly seen in geriatric patients can lead to electrolyte imbalances, contributing to complications such as dehydration, cardiac arrhythmias, and cognitive impairment [1].

3. DIAGNOSTIC METHODS AND MONITORING

Various methods are employed to diagnose electrolyte imbalances in geriatric gastric patients, crucial for managing gastric disorders in the elderly. Blood tests, urine tests, and imaging studies play key roles in monitoring electrolyte levels. Blood tests, as discussed in [6], are essential for detecting hyponatremia, a common issue in the elderly. Additionally, urine tests, highlighted in [3], can provide valuable insights into electrolyte imbalances. Imaging studies, although not directly mentioned in the contexts, can aid in assessing underlying conditions

contributing to electrolyte disturbances. Regular monitoring of electrolyte levels is vital for timely intervention and effective management of gastric disorders in the elderly population, as emphasized in [1].

4. TREATMENT STRATEGIES

This section evaluates current treatment options for managing electrolyte imbalances in geriatric gastric patients, including dietary modifications, pharmacological interventions, and intravenous electrolyte replacement therapy. It discusses the effectiveness and safety of different treatment modalities in this population. Electrolyte imbalances in geriatric patients can lead to increased morbidity and mortality due to age-related physiological changes [6,3]. These imbalances are crucial to address in various conditions, including COVID-19 and neurologic injuries, as they can exacerbate health issues and impact outcomes [12,13]. Treatment options for managing electrolyte imbalances in the elderly encompass dietary modifications, pharmacological interventions, and intravenous electrolyte replacement therapy, emphasizing the importance of monitoring and maintaining healthy hydration levels in this population [14]. Prompt correction of electrolyte disturbances is vital to prevent complications and improve patient outcomes, especially in geriatric individuals prone to fluid and electrolyte imbalances. Identifying and managing these imbalances promptly is essential to prevent syndromes, frailty, and associated health risks in the elderly.

5. DIETARY MODIFICATIONS IN GERIATRIC PATIENTS

Dietary modifications play a crucial role in improving the nutritional status of geriatric patients in various care settings shown in Fig. 1.

Studies have shown that implementing modified diet regimens can significantly increase dietary intake and improve the nutritional status of elderly patients, such as those undergoing hemodialysis [15]. Additionally, texture-modified diets have been highlighted as essential for nursing home residents with swallowing or chewing difficulties shown in Fig. 2., with the availability of appealing texture-modified diets being crucial for adequate nutrition [16,17]. Furthermore, research indicates that diet modifications can lead to beneficial changes in nutrient intake, body functions, and metabolic indicators in chronically mentally ill patients residing in nursing homes [18].

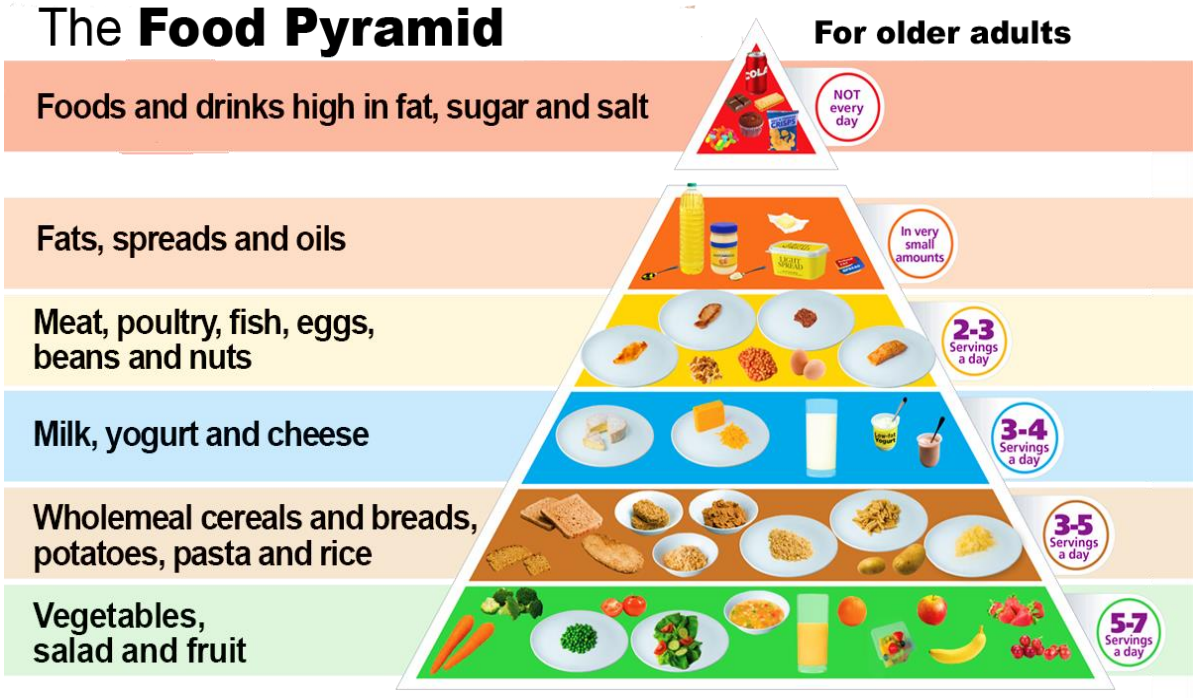

Fig. 1. Geriatric Dietary modifications

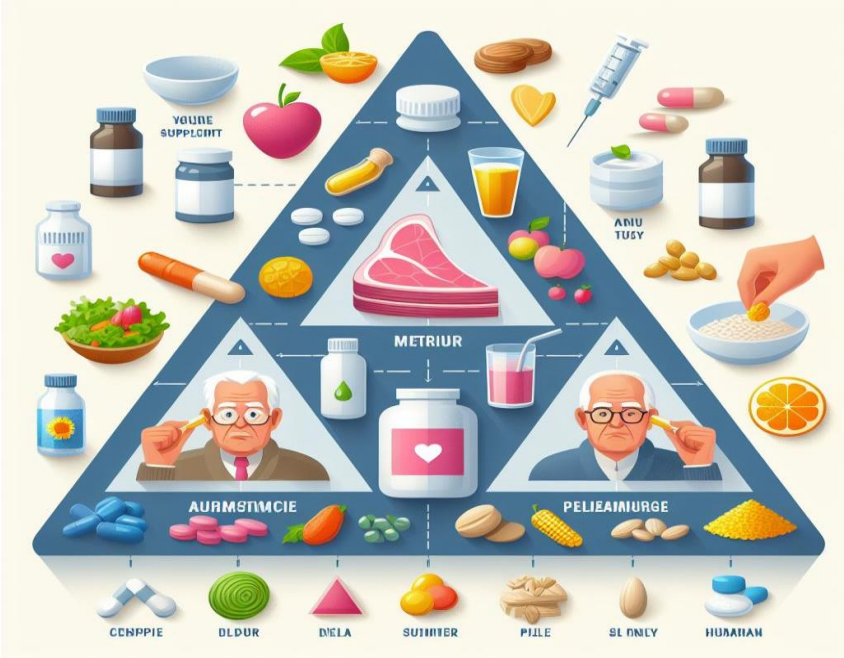

Fig. 2. Geriatric dietary modifications

6. PHARMACOLOGICAL INTERVENTIONS IN GERIATRIC PATIENTS

Pharmacological interventions in geriatric patients have shown significant benefits in optimizing drug management [19,20]. Studies have highlighted the effectiveness of interventions in reducing potentially inappropriate medications and the number of drugs used per person, ultimately decreasing the incidence of PIMs and 30-day readmission rates [21]. Additionally, pharmacist-led interventions have successfully reduced hypnotic drug use in geriatric inpatients without compromising sleep quality, emphasizing the importance of deprescribing strategies in this population [22,23]. These interventions involve various components such as education of healthcare personnel, standardized discontinuation regimens, patient education, and transitional care support, contributing to improved outcomes and safer medication practices in elderly individuals.

Fig. 4. The present guidelines, the definition “the oesophagus with Barrett’s mucosa (a columnar epithelium that extends continuously from the stomach to the oesophagus regardless of the presence of intestinal metaplasia [24].

Algorithm for the diagnosis and treatment of gastroesophageal reflux disease (GERD). a Diagnosis of GERD with endoscopy. b Treatment strategy for severe reflux esophagitis (RE). c Treatment strategy for mild RE. d Treatment strategy for non-erosive reflux disease (NERD). e.Diagnosis of GERD without endoscopy. Red arrows: judged to be negative or unsuccessful treatment. Blue arrows: judged to be a positive or successful treatment. *Prokinetics or Japanese herbal medicine. **Minimal dose of PPI used in cases with good control during 10 mg of vonoprazan. ***Minimal doses of PPI or on-demand therapy may be used [24].

Proton pump inhibitors (PPI) are commonly used in geriatric patients for gastric conditions like gastroesophageal reflux disease and peptic ulcers [25]. However, inappropriate prescription of PPI is prevalent among older inpatients, leading to potential adverse drug interactions, especially with drugs like clopidogrel and citalopram [26]. Additionally, elderly individuals are at a higher risk of adverse drug reactions due to polypharmacy, emphasizing the need for careful consideration of drug-drug interactions in this population [27,28]. While PPIs are effective for gastric protection during NSAID treatment, their long-term use in the elderly has been associated with issues like bacterial overgrowth, infections, hip fractures, nutritional deficiencies, and mortality risks [29].

Table 1. Dosage recommendations for laxatives and cathartics

Agents that Cause Softening of Faces in 1–3 Days	Recommended Dose
Bulk-forming agents/osmotic laxatives	
Methylcellulose	4–6 g/day
Polycarbophil	4–6 g/day
Psyllium	Varies with product
Polyethylene glycol 3350	17 g/dose
Emollients	50–360 mg/day
Docusate sodium	50–360 mg/day
Docusate calcium	100–300 mg/day
Docusate potassium	4–6 g/day
Lactulose	4–6 g/day
Sorbitol	Varies with product
Methylcellulose	17 g/dose
Polycarbophil	50–360 mg/day
Psyllium	50–360 mg/day
Polyethylene glycol 3350	100–300 mg/day
Emollients	4–6 g/day
Docusate sodium	4–6 g/day
Docusate calcium	Varies with product
Docusate potassium	17 g/dose
Lactulose	15–30 mL orally
Sorbitol	30–50 g/day orally
Agents that Result in Soft or Semifluid Stool in 6–12 Hours	
Bisacodyl (oral)	5–15 mg orally
Senna	Dose varies with formulation
Magnesium sulfate (low dose)	<10 g orally
Agents that Cause Watery Evacuation in 1–6 Hours	
Magnesium citrate	18 g 300 mL water
Magnesium hydroxide	2.4–4.8 g orally
Magnesium sulfate (high dose)	10–30 g orally
Sodium phosphates	Varies with salt used
Bisacodyl	10 mg rectally
Polyethylene glycol–electrolyte preparations	4 L
Oral Rehydration Solutions:	

Available ORS Products	Forms of sugar	Carbohydrate, g	Sodium, mEq/L	Chloride, mEq/L	Potassium, mEq/L	Base, mEq/L	Osmolarity, mOsm/L
Ceralyte70	Rice starch	40	70	60	20	30	<220
WHO/UNICEF ORS "Reduced-Osmolarity Formula"	Glucose	25	45	35	20	30	250
Rehydralyte	Glucose	25	75	65	20	30	310
Enfalyte	Rice starch	30	50	40	25	30	200
PediaLyte®	Glucose	25	45	35	20	30	250

Fig. 3. Dosage recommendations for geriatric patients

Ref:(Annals of Long-Term Care: Clinical Care and Aging. 2016;24(2):34-38. Received March 26, 2015; accepted September 14, 2015

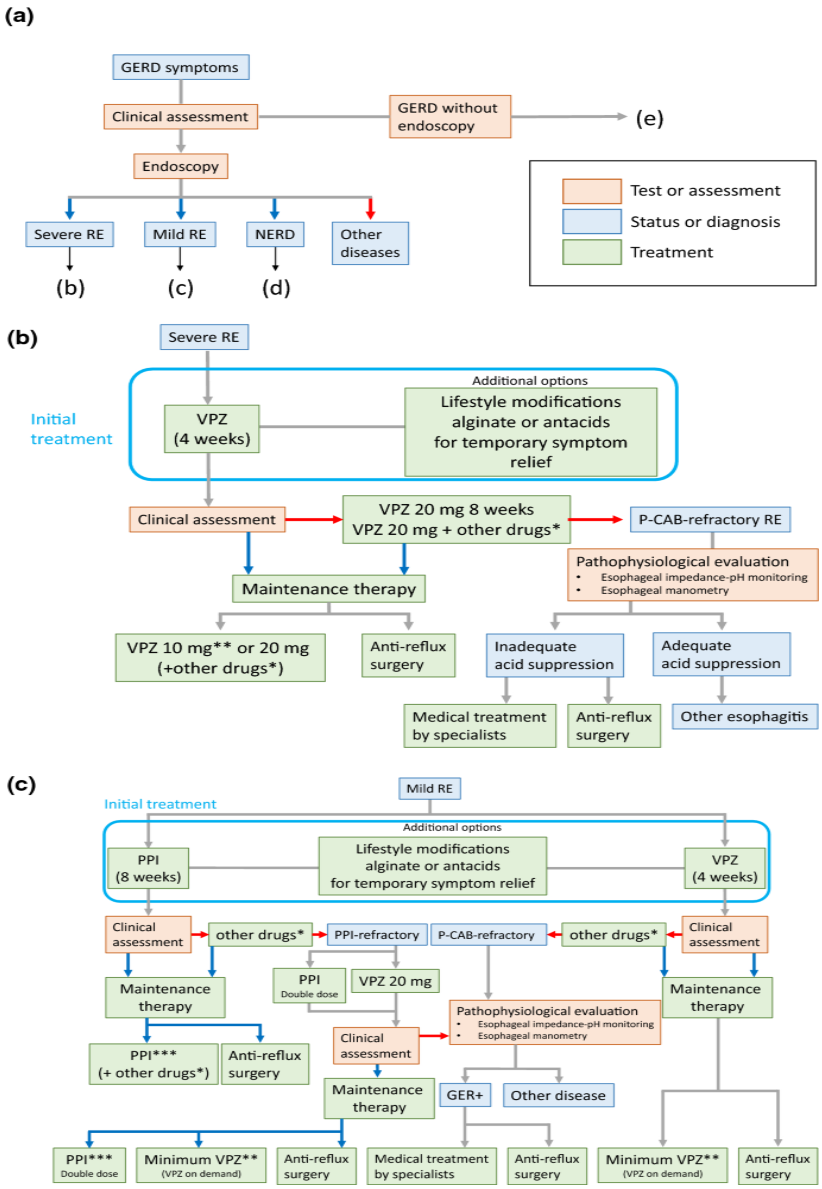

Fig. 4. Algorithm for the diagnosis and treatment of gastroesophageal reflux disease

Table 2. Drugs cause gastric problems to geriatric patients

S.No	Classes of medicines that increase the severity of reflux	Medicines that may cause constipation	Antibiotics to cause Diarrhea
01	Nonsteroidal anti-inflammatory agents (NSAIDs)	Antihypertensives	Penicillin, including ampicillin and amoxicillin
02	Nitrates	Anticholinergics	Clindamycin
03	Theophylline	Cholestyramine	Cephalosporins
04	Calcium channel blockers	Iron	Macrolides, such as clarithromycin
05	Oral antibiotics	Antacids containing mostly aluminum	Fluoroquinolones, such as ciprofloxacin and levofloxacin
06	Birth control pills	Narcotics/pain medicines	Cephalosporins, such as cefdinir and cefpodoxime

7. CLINICAL OUTCOMES AND PROGNOSIS

Electrolyte imbalances in geriatric gastric patients can have significant implications on prognosis and mortality rates. Studies highlight that hyponatremia is a common disorder in older patients, leading to cognitive deficits, falls, fractures, and increased mortality rates [30]. Additionally, patients undergoing percutaneous endoscopic gastrostomy (PEG) for neurologic dysphagia or head/neck cancer often present with electrolyte alterations, particularly hyponatremia, which is associated with shorter survival times, reflecting severe systemic metabolic distress [31]. Furthermore, community-acquired hypokalemia (CAH) is prevalent in the elderly, with factors like loop diuretics, hydrochlorothiazides, and female gender posing as independent risk factors, leading to longer hospital stays, increased costs, and higher mortality rates in this population [32,33]. Proper management and monitoring of electrolyte imbalances are crucial in improving outcomes and reducing mortality in geriatric gastric patients.

8. FUTURE DIRECTIONS AND RESEARCH IMPLICATIONS

Future research in geriatric gastric patients should focus on the impact of electrolyte imbalances on clinical outcomes, especially in conditions like hyponatremia and refeeding syndrome. Interdisciplinary collaboration is crucial to developing personalised approaches for managing electrolyte disturbances in this vulnerable population. Studies should investigate the association between electrolyte alterations and mortality rates, as highlighted in various papers [34,35,36]. Additionally, exploring the prevalence of electrolyte abnormalities in geriatric patients undergoing percutaneous endoscopic gastrostomy (PEG) and their impact on survival can provide valuable insights [37]. Research should also address the challenges posed by polymorbidity and polypragmasia in pharmacotherapy, which complicate the maintenance of water and mineral balance in older individuals [38]. Understanding these aspects can enhance the quality of care and outcomes for geriatric patients with gastric issues [39,40].

9. DISCUSSION

The mini-view underscores the prevalence of electrolyte imbalances in geriatric gastric patients and their impact on clinical outcomes, emphasizing the need for proactive management strategies. Diagnostic methods such as blood tests, urine tests, and imaging studies play a crucial role in identifying electrolyte disturbances early. Treatment options include dietary modifications, pharmacological interventions, and intravenous electrolyte replacement therapy, tailored to individual patient needs. Moreover, the review discusses the implications of electrolyte imbalances on prognosis and mortality rates, highlighting the importance of proper management and monitoring in improving patient outcomes.

This mini-review consolidates findings on electrolyte management in geriatric patients with gastric issues, emphasizing diagnostic techniques, treatment modalities, and resultant clinical progressions. It illuminates gaps in existing research and advocates for future investigations to delve into tailored interventions and interdisciplinary teamwork for addressing electrolyte imbalances in elderly individuals with gastric conditions.

10. CONCLUSION

In conclusion, managing electrolyte imbalances in geriatric patients with gastric disorders is a complex but essential aspect of healthcare that significantly impacts patient outcomes. Future research should focus on refining these management strategies, exploring the long-term effects of various interventions, and enhancing interdisciplinary care models to further improve the quality of care and outcomes for geriatric patients with gastric disorders. By addressing electrolyte imbalances proactively and comprehensively, healthcare providers can significantly enhance the well-being and prognosis of this vulnerable population.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Sanjay Kalra, Nitin Kapoor, Jubbin Jagan Jacob, Navneet Agarwal, Priti Thakor, Harshad Malve. Fluid imbalance in geriatrics: The need for optimal hydration. Journal of Association of Physicians of India; 2023.
   DOI: 10.59556/japi.71.0283
2. Jordan, Poe., Sai, Sriram., Yusuf, Mehkri., Brandon, Lucke-Wold. Electrolyte Imbalance and Neurologic Injury. Cns & Neurological Disorders-drug Targets, (2023).
   DOI:10.2174/1871527322666230215144649
3. Jordan Poe, Sai Sriram, Yusuf Mehkri, Brandon Lucke-Wold. Electrolyte imbalance and neurologic injury. Cns & Neurological Disorders-drug Targets; 2023.
   DOI: 10.2174/1871527322666230215144649
4. Markus Gosch. Hyponatraemia in elderly patient - significance, clarification and therapy. Deutsche Medizinische Wochenschrift; 2022.
   DOI: 10.1055/a-1643-6204
5. Zdeněk Zadák, Alena Ticha, Radomír Hyšpler. Electrolyte and water disorders in old age. Vnitřní lékařství; 2018.
   DOI: 10.36290/VNL.2018.151
6. Perioperative Electrolyte Abnormalities; 2023.
   DOI:10.1093/med/9780197584521.003.0163
7. Simge Bardak, Kenan Turgutalp, Mahmut Bakır Koyuncu, H, Harı, İlter Helvacı, Didem Ovla M, Horoz Serap, Demir Ahmet, Kiykim. Community-acquired hypokalemia in elderly patients: Related factors and clinical outcomes. International Urology and Nephrology; 2017.
   DOI: 10.1007/S11255-016-1489-3
8. Kalash Chander. A retrospective study of electrolyte imbalance among elderly patients and its relationship to the outcome and duration of stay in emergency—International Journal of Clinical Trials; 2022.
   DOI: 10.18203/2349-3259.ijct20221564
9. Anna Królicka, Adrianna Kruczkowska, Magdalena Krajewska, Mariusz Kusztal. Hyponatremia in infectious diseases- A literature review. International Journal of Environmental Research and Public Health; 2020.
   DOI: 10.3390/IJERPH17155320
10. Subba Dil Prasad, Kumar Satyender. Exploring the therapeutic potential of selective modulation of serotonin receptor subtypes in neurological and metabolic disorder. International Journal in Pharmaceutical Sciences. 2024;2(3):260–277.
    Available:https://doi.org/10.5281/zenodo.10800578.
11. A, S, Inggil A, Suparmi Suci, Faniandari. Solution of Klein-Gordon equation screened Hartmann ring-shaped plus Kratzer potential using hypergeometry method. Nucleation and Atmospheric Aerosols; 2023.
    DOI: 10.1063/5.0105727
12. Electrolyte Disorders; 2022.
    DOI: 10.1002/9781119105954.ch60
13. Mahsa Abbaszadeh, Fatemeh Gorgani, Safa Javadi Tabrizi, Nasim Khajavirad, N, Zarei, Jalalabadi, Sahar Karimpour Reihan, Mohammad Najafi, M, Daraei. The prevalence of electrolyte imbalances and their relationship with disease severity in hospitalized COVID-19 patients. Iranian Journal of Clinical Infectious Diseases; 2022.
    DOI: 10.5812/archcid-112190
14. Maryam Miri, Shaghayegh Badriahmadi, Ali Shamshirian, Amir Ali, Moodi Ghalibaf, Mahnaz Mozdourian. Electrolyte imbalance and COVID-19 severity in hospitalized patients. Nephro-urology monthly; 2022.
    DOI 10.5812/numonthly-128085
15. Mariola Elżbieta Friedrich, Joanna Fugiel, Magda Bruszkowska. Assessing effects of diet alteration on selected parameters of chronically mentally ill residents of a 24-hour Nursing Home. Part I: Effects of diet modification on carbohydrate-lipid metabolism. Psychiatria Polska; 2020.
    DOI: 10.12740/PP/123349
16. Makiko Yamashita, Rieko Komatsu, Yuko Maruyama, Tomoyuki Takaki, Hiroshi Ichinose, Osamu Sasaki, Kenji Sawase, Takashi Harada, Satoshi Funakoshi. Dietary approach to improving the nutritional status in institutionalized elderly hemodialysis patients with a poor dietary intake: A single-arm pilot study. Japanese journal of geriatrics; 2018.
    DOI: 10.3143/GERIATRICS.55.90

17. C, Velasco, Pilar García-Peris. Food technology and evolution in texture-modified foods: From crushed or dehydrated to current products. Hospital Nutrition; 2014.
DOI: 10.3305/NH.2014.29.3.7153
18. Anne Marie Beck, Lars Ovesen. The effect of diet modification on dietary intake, and body weight of elderly nursing home residents formerly receiving chopped or blended diets. a pilot trial. Foodservice Research International; 2004.
DOI:10.1111/J.1745-4506.2004.TB00191.X
19. Shuang Zhou, Rui Li, Xiaolin Zhang, Yutong Zong, Lili Lei, Zhenhui Tao, Min-Xue Sun, Hua Liu, Ying Zhou, Yimin Cui. The effects of pharmaceutical interventions on potentially inappropriate medications in older patients: a systematic review and meta-analysis. Frontiers in Public Health; 2023.
DOI: 10.3389/fpubh.2023.1154048
20. Pharmaceutical Intervention in the Pharmacological Therapy of Elderly Patients in San Luis-ECUADOR. Pharmacy Practice (Internet); 2023.
DOI: 10.18549/pharmpract.2023.1.2771
21. Lorenz Van der Linden, Julie Hias, A, Liesenborghs, Karolien Walgraeve, Pieter Van Brantegem, Laura Hellemans, Koen Milisen, Jos Tournoy. The impact of a pharmacist intervention on post-discharge hypnotic drug discontinuation in geriatric inpatients: a before-after study. BMC Geriatrics; 2023.
DOI: 10.1186/s12877-023-04139-y
22. Romain Leguillon, Rémi Varin, Thibaut Pressat-Laffouilhere, Catherine Chenailler, Philippe Chassagne, Frédéric Roca. Clinical pharmacist intervention reduces potentially inappropriate prescriptions in a geriatric perioperative care unit dedicated to hip fracture. Gerontology; 2022.
DOI: 10.1159/000526595
23. The impact of a pharmacist intervention on post-discharge hypnotic drug discontinuation in geriatric inpatients: A before-after study; 2022.
DOI 10.21203/rs.3.rs-2012686/v1
24. Iwakiri K, Fujiwara Y, Manabe N, et al. Evidence-based clinical practice guidelines for gastroesophageal reflux disease 2021. J Gastroenterol. 2022;57:267–285.
25. Riccardo Fagiano, Yolanda Falcone, Gianfranco Fonte, Clara Cena, Enrico Brunetti, Mario Bo. Indications, appropriateness and drug interactions of proton pump inhibitors prescribed at hospital discharge in older medical patients. Geriatrics & Gerontology International; 2017.
DOI: 10.1111/GGI.13043
26. Mladen Davidovic, Petar Svorcan, Pavle Milanovic, Aleksandar Antovic, Dragoslav P, Milosevic. Gastropathy of old age: Helicobacter pylori infection or NSAID use. MedGenMed: Medscape general medicine; 2004.
27. Marina Kim, Aamir Dam, Jesse A, Green. Common GI drug interactions in the elderly. Current Treatment Options in Gastroenterology; 2014.
DOI: 10.1007/S11938-014-0024-9
28. Brendan Crotty, Richard A, Smallwood. Upper gastrointestinal tract. The Medical Journal of Australia; 1995.
DOI: 10.5694/J.1326-5377.1995.TB138445.X
29. Koop H. Drug therapy of peptic ulcer in the elderly. Zeitschrift für Gerontologie; 1992.
30. F, Grundmann. Electrolyte disturbances in geriatric patients with a focus on hyponatremia. Zeitschrift Fur Gerontologie Und Geriatrie; 2016.
DOI: 10.1007/S00391-016-1117-Y
31. Joana Vieira, Gonçalo Nunes, Carla Adriana Santos, Jorge Fonseca. Serum electrolytes and outcome in patients undergoing endoscopic gastrostomy. Arquivos De Gastroenterologia; 2018.
DOI: 10.1590/S0004-2803.201800000-05
32. Kalash Chander. A retrospective study of electrolyte imbalance among elderly patients and its relationship to the outcome and duration of stay in emergency—International Journal of Clinical Trials; 2022.
DOI: 10.18203/2349-3259.ijct20221564
33. Simge Bardak, Kenan Turgutalp, Mahmut Bakır Koyuncu, H, Harı, İlter Helvacı, Didem Ovla, M, Horoz Serap Demir, Ahmet Kiykim. Community-acquired hypokalemia in elderly patients: Related factors and clinical outcomes. International Urology and Nephrology; 2017.
DOI: 10.1007/S11255-016-1489-3
34. F, Grundmann. Electrolyte disturbances in geriatric patients with a focus on hyponatremia. Zeitschrift Fur Gerontologie Und Geriatrie; 2016.
DOI: 10.1007/S00391-016-1117-Y
35. Joana Vieira, Gonçalo Nunes, Carla Adriana Santos, Jorge Fonseca. Serum

electrolytes and outcome in patients undergoing endoscopic gastrostomy. Arquivos De Gastroenterologia; 2018.
DOI: 10.1590/S0004-2803.201800000-05

36. Zdeněk Zadák, Alena Ticha, Radomír Hyšpler. Electrolyte and water disorders in old age. Vnitřní lékařství; 2018.
DOI: 10.36290/VNL.2018.151.

37. Kalash, Chander. A retrospective study of electrolyte imbalance among elderly patients and its relationship to the outcome and duration of stay in emergency—International Journal of Clinical Trials; 2022.
DOI: 10.18203/2349-3259.ijct20221564

38. Marcus Vinicius, Palmeira Oliveira, David Costa, Buarque. Síndrome de realimentação em idosos: estudo de uma série de cinco casos. Geriatrics, gerontology and ageing; 2017.
DOI: 10.5327/Z2447-211520171600081

39. Polypharmacy: Definition, Epidemiology, Consequences and Solutions. Practical issues in geriatrics; 2023.
DOI: 10.1007/978-3-031-28061-0_2

40. Juneja M, Baidoo L, Schwartz MB, Barrie A, Regueiro M, Dunn M, Binion DG. Geriatric inflammatory bowel disease: phenotypic presentation, treatment patterns, nutritional status, outcomes, and comorbidity. Digestive diseases and sciences. 2012;57:2408-15.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/117993