Original Article

Association between the Long-Term Use of Over-the-Counter Laxative and Biochemical and Inflammatory Markers in Older Adults: Comparative Cross-Sectional Study

Rusul Ali Kadhim*

Department of Pharmacology, College of Medicine, University of Babylon, Hilla 51002, Babylon, Iraq.
* Corresponding author: dr.rusul_alkafaji@uobabylon.edu.iq

Submission: July 31, 2026 Accepted: September 28, 2026 Published: September 30, 2026

Abstract

Background: Constipation is a common issue among the geriatric population which often leads to the chronic use of over-the-counter (OTC) laxatives. Some of laxatives act by drawing water, causing loose stools or causes irritate the colon, leading to accelerated motility. **Objective:** Evaluate the association between chronic use of laxatives (lactulose, polyethylene glycol (PEG), and Agiolax (psyllium senna) and biochemical, inflammatory parameters in geriatric patients. **Materials and Methods:** This comparative cross-sectional study included 150 geriatric patients who had chronic constipation and on OTC laxatives (lactulose, PEG and Agiolax) for long-term titrated to response. Fifty patients in each group, alongside, fifty patients had history of chronic constipation without using laxatives as control. Blood samples were collected from the patients. The measured parameters included serum Na+, K+ and Cl-, blood urea, serum creatinine, erythrocytes sedimentation rate (ESR) and C-reactive protein. **Results:** Lactulose and PEG use associated with significant elevation of serum sodium. Lactulose use group associated with significant hypochloremia. PEG and Agiolax treated groups showed statistically significant reduction in serum chloride. Both lactulose and Agiolax treated groups showed significant hypokalemia and significant elevation in blood urea and serum creatinine. Lactulose treated group shows statistically significant elevation in ESR when compared to control group while Agiolax shows statistically significant reduction. Positive neurological symptom associated with electrolytes disturbance in70% patients on lactulose and 52% of those on PEG. Positive cardiovascular appeared in 46% of patients on lactulose and 58% of those using Agiolax. **Conclusions:** Chronic administration of OTC laxative is associated with electrolytes deregulation such as hyponatremia, hypokalemia and elevation of blood urea and serum creatinine pointing to acute renal strain.

Keywords: OTC Laxatives, Old patient, Constipation

Introduction

A geriatric person is an older adult, who is usually 65 years or older, who might need professional healthcare due to the unique health issues that come with ageing. Clinically, geriatric care relies on preventive treatment, including vaccinations, screenings, and management of chronic conditions like hypertension, arthritis, and Alzheimer's disease; physical care involves physiological and intellectual evaluation considering independence and ability to move [1]. Over-the-counter (OTC) pharmaceuticals are medications that customers can buy without a prescription from a healthcare professional. These medications are often used to treat illnesses that are readily self-diagnosed, such as headaches, colds, allergies, and minor aches and pains [2]. Health authorities, such as the Food and Drug Administration (FDA), regulate OTC medications to ensure that they are safe and effective for consumer use without the need for professional medical supervision. Geriatric age is

closely associated with an increased risk of constipation due to a variety of ageing-related and frequent illnesses in older persons. The incidence and prevalence of constipation increase in both sexes for all aged patients [3]. The prevalence of constipation at the age of 65 years is about 15-30%, and it affects almost 50% at age 80 years [4]. Constipation significantly reduces the quality of life and places a financial strain on people and national medical resources [5]. Immobility, weakness of the abdominal and pelvic floor muscles, malnutrition, rectal hyposensitivity, ignoring a "defecation call," chronic medical conditions (metabolic, neurological, and cardiovascular), long-term medication use (analgesics, calcium channel blockers, antihypertensive drugs, and antipsychotics), and aging can affect the colonic motility and they represent the main risk factors for constipation in the elderly population [6]. Furthermore, constipation that may develop in elderly people may lead to behavioral, social, and psychological issues [7]. It is more common in elderly persons because of polypharmacy and physiological alterations brought on by aging in addition to comorbidities such as diabetes. Laxative drugs are commonly used to solve the constipation issue; they are either bulk-forming, such as psyllium or methylcellulose, which act by absorbing water, leading to softened stool and increased bulk [8], osmotic laxatives such as lactulose, polyethylene glycol (PEG), and magnesium hydroxide act by drawing water into the colon, causing loose stool [9], or stimulants like senna and bisacodyl, which irritate the colon, causing accelerated motility [10]. Stool softener docusate sodium mediates emulsification of the stool [11]. OTC laxatives are one of the important major health issues that should be recently highlighted, because prolonged use of these drugs carries the risk of dependency and tolerance, as long-term administration could lead to a lazy bowel, so the colon becomes reliant on stimulants to function, that can lose normal peristalsis [12]. Chronic laxative usage can worsen the comorbidities that many older patients have, such as diabetes, heart disease, and renal impairment, also it can cause concealment of dangerous illnesses that might manifest as constipation, such as Parkinson's disease, hypothyroidism, or colon cancer [13]. Furthermore, mineral and electrolyte disturbances from diarrhea due to chronic use of laxatives raise the likelihood of osteoporosis, anemia, and malnutrition, which are already common among elderly Iraqis due to nutritional and financial difficulties [14]. The vast majority of geriatric patients present to outpatient clinics or emergency departments complaining of severe complications related to the overuse of OTC laxative drugs, such as cardiac arrhythmia and neurological manifestations as result of electrolytes disturbances and as consequent of prolonged use of OTC laxatives. Therefore, this study aims to evaluate the biochemical and inflammatory parameters associated with the chronic use of different OTC laxatives in elderly patients, in an effort to better understand these complications and help mitigate this growing health problem.

Materials and Methods

Study design and setting

This comparative cross-sectional study was conducted from March to December 2025, utilizing data and samples from both outpatients and the emergency department of Imam Al-Sadeq Teaching Hospital. The study included 150 patients; of both sexes with a mean age of 66 ± 1.5 years and a mean BMI of 28.5 ± 3.3 kg/m². Patients were divided into three groups each one contains 50 patients who were used either Lactulose, PEG, or Agiolax. The control group consisted of 50 individuals with history of

chronic constipation for more than three months without using regular laxative medications, age and BMI means (66 ± 1.8 years and a mean BMI of 27.8 ± 3.1 kg/m² respectively) were compatible to those for the treated patients groups and they were matched with all other groups of patients for comorbidity burden, and the medication history was comparable between groups.

Patient characteristics demographic distribution of the subgroups:

A. Sex distribution in each subgroup

Table 1: Sex distribution in laxative treated groups

Laxative	Gander %		
	Male	Female	Total
Lactulose	27 (54%)	23 (46%)	50
Polyethylene glycol	22 (44%)	28 (56%)	50
Agiolax	30 (60%)	20 (40%)	50
Total	79 (52.7%)	71 (47.3%)	150

B. Duration and doses of administration of laxative in each sub-group

Table 2: types of laxatives duration and dosage

Laxative	Duration of treatment	Average dose
Lactulose	Long-term titrated to response	15-30 mL once daily
PEG	Long-term titrated to response	17 g daily in 240 mL water
Agiolax	continuously for 2-3 weeks /month for more than 3 months	1-2 teaspoons of granules daily

Major comorbidities in patients on laxative drugs

Table 3: major comorbidities of patients and their percentage

Disease	Number (percentage)	Type treatment
Diabetes mellitus	20 (13.33%)	12 patients type one DM on insulin, 8 patients type two DM on 1000 mg twice daily metformin all are well control blood sugar
Hypertension	19 (12.66%)	Angiotensin receptor blocker + salt restriction well control blood pressure
Heart failure	14 (9.33%)	Sacubitril /Valsartan and/or angiotensin receptor blockers (ARB_S)
Strok	22(14.66%)	Aspirin 100mg daily

Inclusion Criteria

A. Patients aged ≥65 years, who attended the emergency department and on laxative (lactulose or PEG or Agiolax) for Long-term titrated to response, had no history of medical drugs that affect bowel function, had good dietary fiber intake/day, no previous history of exposure to laxative drugs due to intestinal issues, and were willing to participate and provide blood samples. The patients administered these laxative drugs due to the two or more of the following reasons:

1. History of feeling of incomplete evacuation for more than 5-7 days/month
2. Hard stool and painful to pass about 3 times/week.
3. Excessive straining during bowel movement
4. Sensation of anorectal obstruction
5. Infrequent bowel movements (fewer than three spontaneous bowel movement /week).

B. Clinical presentation: patients who attended the emergency department due to dehydration or for mild neurological manifestations such as lethargy and confusion; by history they were on one of the laxatives (lactulose, PEG, and Agiolax).

Exclusion criteria

Patients with a history of renal disease or electrolyte abnormalities, those on medications known to affect electrolytes or renal function, patients with a history of inflammatory bowel

disease or chronic hematological illnesses, and patients on medication that interferes with bowel function.

Sample collection

Venous blood was collected from both the laxatives treated patients and the control group. Some of blood sample were isolated in ethylene diamine tetra acetic acid tube and mixed gently for measuring ESR the other blood sample were collected in plain serum tube allow clot formation, the samples were centrifuged at 1.200-2.150 *xg* (3,000–4,000 rpm) for 10 minutes. The serum was then collected and analyzed using an autoanalyzer to evaluate serum electrolytes (Na+, Cl−, and K+), blood urea, and serum creatinine. These specific samples were immediately wrapped in foil to protect them from light and saved in a deep-frozen until analysis.

Principles of laboratory analysis

For blood urea, this is an enzymatic urase colorimetric method; its action is based on the conversion of urea into ammonia and carbon dioxide. The ammonia then interacts with a reagent to form a colored product, and the absorbance of the standard and test samples is used to compute the result via a standard curve. Serum creatinine was evaluated using kinetics Jaffe reaction (alkaline picrate) a spectrophotometer at a wavelength 505 nm; the color intensity correlated directly with the creatinine concentration. Standard solutions were used to validate accuracy. The electrolytes were evaluated by an automated analyzer; serum chloride was measured via direct colorimetry, while an ion-selective electrode was used to evaluate both serum sodium and potassium. C-reactive protein (CRP) was measured using latex-enhanced immunoturbidimetry. This principle uses antibodies coated on microscopic latex particles to amplify immune complexes, significantly increasing detection sensitivity. ESR were measured by automated ESR analyzer by using infrared/optical scanning in which infrared pass through the sample for track the plasma red blood cells continuously and the sedimentation kinetics will calculate within 15-30 minutes.

Table 4: Summary for laboratory protocol and manufactures

Analyzed parameter	Methodology	Manufacturer
Blood urea	Enzymatic colorimetric	Abbott Alinity
Serum Creatinine	Spectrophotometric (564-570nm)	Abbott Alinity
Sodium & Potassium	Ion-Selective Electrode	Roche Cobas
Serum Chloride	Direct Colorimetry	Roche Cobas
Erythrocyte sedimentation rate	automated ESR analyzer	Alcor Scientific (USA)
C-Reactive Protein	Latex-enhanced Immunoturbidimetry	Roche Diagnostics

Statistical Analysis

Data were analyzed using SPSS Version 30 (2024), with a *P-value* of less than 0.05 considered statistically significant. Where the assumption of homogeneity of variance was met, a standard one-way analysis of variance (ANOVA) to compare between each treated group with control for pairwise comparisons among the treated groups we used Dunnett's post-hoc test.

Ethical Approval

This study was conducted in accordance with ethical principles and was officially approved, by the local ethics committee (Document Number: 3122) on March 2nd, 2025 and the informed consent was obtained from all the patients that participated in this study.

Results

Baseline characteristics comparison between control and treated groups

Table 5: Baseline demographic and clinical characteristics

Characteristic	Control (N = 50)	Laxative-Treated Patients (N = 150)	p-value
Age (years), mean ± SD	66± 1.5	66 ± 1.8	1.00[a]
Sex (Female), *n (%)*	27 (54.00%)	71 (47.33%)	0.41[b]
Sex (male), *n (%)*	23 (46.00%)	79 (52.77%)	N/A
BMI kg/m^2 (mean ± SD)	27.8 ± 3.1	28.5 ± 3.3	0.19[a]

[a] Calculated using an independent two sample t- test, [b] calculated using *pearsons chi-square* test (X^2 =0.67, *df*=1) significant set at p<0.05

Effect of laxative drugs on serum sodium level

Figure (1) showed significant elevation (P<0.001) in the serum sodium level for both groups of patients using lactulose and PEG when compared to the control group (148.60±1.40, 146.00±1.60 vs140.80±2.40) while there is no significant difference (P=0.66) between Agiolax and control groups. On the other hand, Agiolax showed significant reduction(p<0.05) in the level of serum sodium in comparison to both lactulose and PEG. (141.00±2.20 vs148.60±1.40, 146.00± 1.60).

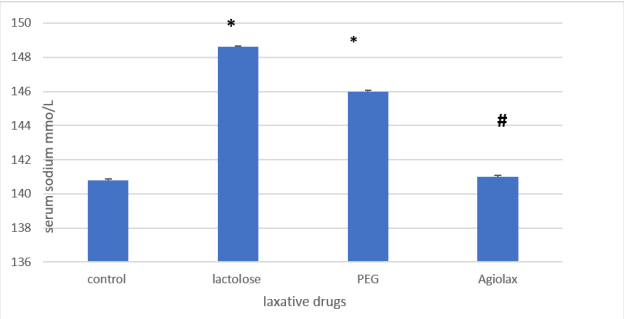

Figure 1: Effect of laxative drugs on serum sodium(mmol/L) level

Table 6: Serum sodium mean ± SD, 95% confidence interval (CI) and P-value for patients on laxative drugs in comparison with the control group.

Group	Control N=50	Lactulose =50	PEG N=50	Agiolax N=50
Mean± SD (mmol/L)	140.80±2.4	148.60±1.4	146.0±1.6	141.0±2.2
Standard Error (SE)	0.03	0.07	0.04	0.07
95%CI	[140.13, 141.47]	[148.21, 148.99]	[145.56, 146.44]	[140.39, 141.61]
P -value	_	<0.001	<0.001	N.S (0.66)

*P- values are derived from pairwise comparisons against the control group using Dunnett's post-hoc test.

Effect of laxative drugs on serum chloride level

Figure (2) showed significant reduction (P<0.001) in the serum chloride level in patients using lactulose compared to the control group (75.50±1.60 vs 98.40±3.20) and both other treated groups (75.50±1.60 vs 100.80±3.30, 96.30±3.60) while both PEG and Agiolax showed non-significant difference (p>0.05) when compared to control group (100.80±3.30, 96.30±3.60 vs 98.40±3.20)

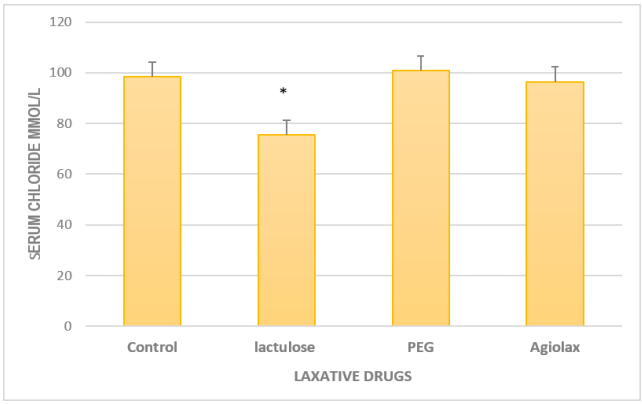

Figure 2: Effect of laxative drugs on serum chloride level

Table 7: Serum chloride mean ± SD, 95% confidence interval (CI) and P-value for patients on laxative drugs in comparison with the control group

Group	Control N=50	Lactulose N=50	PEG N=50	Agiolax N=50
Mean± SD (mmol/L)	98.4±3.2	75.5±1.6	100.8±3.3	96.3±3.6
Standard Error (SE)	0.45	0.23	0.47	0.51
95%CI	[97.50, 99.30]	[75.05, 75.95]	[99.87, 101.73]	[95.28, 97.32]
P-value	-	<0.001	<0.01	<0.01

*P- values are derived from pairwise comparisons against the control group using Dunnett's post-hoc test.

Effect of laxative drugs on serum potassium level

Figure (3) showed significant reduction (P<0.001) in the serum potassium level in patients using lactulose and Agiolax compared to the control group (2.90±0.51,3.00±0.53vs 04.20±0.22) but there was no significant difference between the PEG and control groups (P=0.4) (4.10±0.32 vs04.20±0.22) as well as both lactulose and Agiolax showed significant reduction in serum potassium when compare to PEG group.

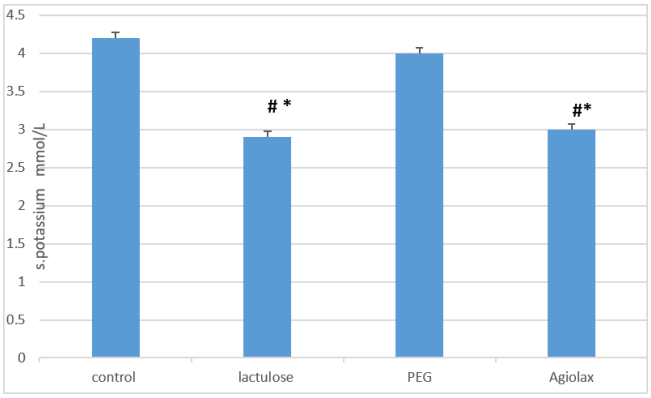

Figure 3: Effect of laxative drugs on serum potassium level

Table 8: Serum potassium mean ± SD, 95% confidence interval (CI) and P-value for patients on laxative drugs in comparison with the control group.

Group	Control N=50	Lactulose N=50	PEG N=50	Agiolax N=50
Mean± SD (mmol/L)	04.2±0.22	2.9±0.51	4.1±0.32	3.0±0.53
Standard Error (SE)	0.03	0.07	0.05	0.07
95%CI	[4.14, 4.26]	[2.76, 3.04]	[4.01, 4.19]	[2.85, 3.15]
P-value	-	<0.001	N.S (0.400)	<0.001

*P- values are derived from pairwise comparisons against the control group using Dunnett's post-hoc test

Effect of laxative drugs on blood urea level

Figure (4) showed highly significant elevation (p<0.001) in the level of blood urea in both lactulose and Agiolax when compared to the control group (12.50±0.50, 11.70±0.40 vs 6.50±1.30) while those using PEG showed no significant different (p>0.05) in it when compared to control group (5.80±1.10 vs 6.50±1.30).

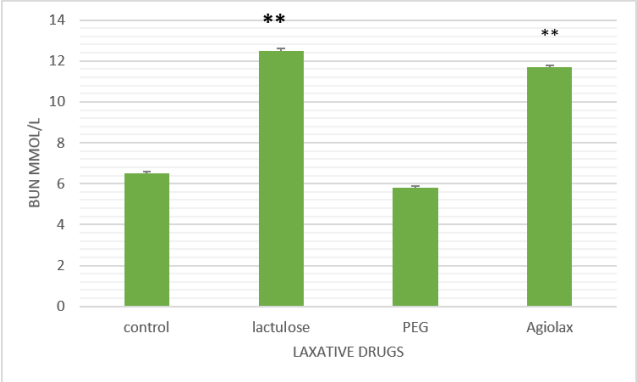

Figure 4: Effect of laxative drugs on blood urea level

Table 9: blood urea mean ± SD, 95% confidence interval (CI) and P-value for patients on laxative drugs in comparison with the control group.

Group	Control N=50	Lactulose N= 50	PEG N=50	Agiolax N=50
Mean± SD (mmol/L)	6.5±1.3	12.5±0.5	5.8±1.1	11.7±0.4
Standard Error (SE)	0.18	0.07	0.15	0.05
95% CI	[6.14, 5.86]	[12.36, 12.64]	[5.49, 6.11]	[11.59, 11.81]
P-value	-	<0.001	N.S (>0.05)	<0.001

*P- values are derived from pairwise comparisons against the control group using Dunnett's post-hoc test

Effect of laxative drugs on serum creatinine level

Figure (5) showed highly significant elevation in the level of serum creatinine in both lactulose and Agiolax (p<0.001) when compared to the control group (142.00 ±1.3, 138.00±0.2 vs 84.00±0.3) while those patient on PEG shows non-significant different (p>0.05) when compared to the control group (85.00±6.6 vs 84.00±0.3).

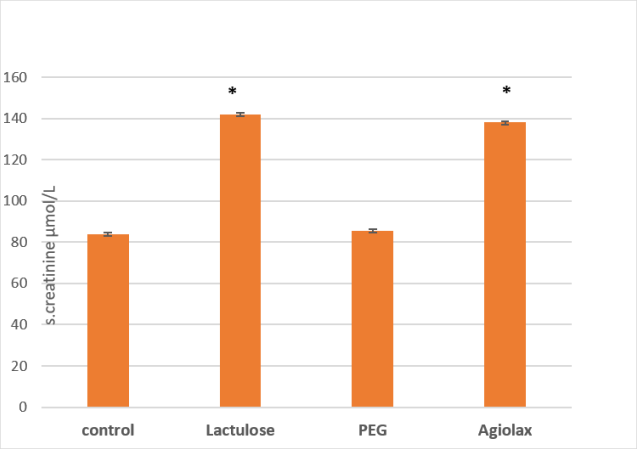

Figure 5: Effect of laxative drugs on serum creatinine level

Table 10: Serum creatinine mean ± SD, 95% confidence interval (CI) and P-value for patients on laxative drugs in comparison with the control group.

Group	Control N=50	Lactulose N=50	PEG N=50	Agiolax N=50
Mean± SD (µmol/L)	84.0±0.3	142.0 ±1.3	85.0±6.6	138.0±0.2
Standard Error (SE)	0.4	0.18	0.8	0.2
95% CI	[83.92, 84.08]	[141.64, 142.36]	[83.17, 86.83]	137.94, 138.06]
P-value	-	<0.001	N.S (0.28)	<0.001

*P- values are derived from pairwise comparisons against the control group using Dunnett's post-hoc test

Effect of laxative drugs on C-reactive protein

Table 11: *Chi-square analysis* of C-reactive protein (CRP) status across laxative treatment groups

Group (CRP)	Observed (O)	Expected (E)	$(O-E)^2/E$
Lactulose(positive)	35	35	0
Lactulose(negative)	15	15	0
PEG (positive)	40	35	≈0.714
PEG (negative)	10	15	≈1.667
Agiolax(positive)	30	35	≈0.714
Agiolax(negative)	20	15	≈1.667

The summing of these data is giving final X^2= 4.762, *df* =2 and at standard level of significance α (0.05), the critical value from chi-square distribution table was 5.991, the P value=0.092 which was greater than 0.05, the chi-square value =4.742 which was less than critical value=5.991 and the p-value =0.092 more than 0.05). There is no significant association between all treated groups (lactulose, PEG, Agiolax) when compared with each other and the rate of CRP positively at 5% significant level. However, PEG showed higher rate [proportion/descriptive= 40/50]= (80%) of positive cases when it compares to that of Agiolax which is (60%).

Effect of laxative drugs on erythrocytes sedimentation rate

Table 12: shows two-way Anova analysis of erythrocytes sedimentation rate across the gender and laxative treatment group

Gender	Group	Sample size(N)	ESR (mean±SD) Mm/hr.	*p-value* (*vs* control)
Male	Control	23	13.5±2.3	-
	Lactulose	21	16.3±4.5	0.003
	PEG	23	12.8±3.2	0.445
	Agiolax	27	13.7±2.1	0.821
Female	Control	27	21.3± 4.1	-
	Lactulose	25	25.8±2.7	<0.001
	PEG	26	16.4±2.0	<0.001
	Agiolax	28	18.6±3.3	0.001

The result showed statistically significant increase in ESR in both gender in patients using lactulose (p=0.003, <0.001) when compare to the corresponding control group, for female in both PEG(P<0.001) and Agiolax (p=0.002) result showed significant reduction in the level of ESR when compared to control group. But in male neither PEG(P=0.445) nor Agiolax(p=0.821) result in statistical difference when compared to control group.

The clinical manifestations in old patients on long term over the counter laxatives

Table 13: Clinical manifestations in old patient on OTC laxatives

Laxatives	Neurological presentations (confusion, lethargy)		Cardiovascular presentations (orthostatic hypotension)	
	Positive	Negative	Positive	Negative
Lactulose N= (50)	35(70%)	15(30%)	23(46%)	27(54%)
PEG N= (50)	26(52%)	24(48%)	10(20%)	40(80%)
Agiolax N= (50)	11(22%)	39(78%)	29(58%)	21(42%)

Discussion

Lactulose is a sweet synthetic unabsorbable sugar which acts as an osmotic laxative and often causes electrolyte imbalance and dehydration, including hypernatremia due to loss of free water in stool without electrolyte replacement. PEG is also intended to reduce sodium shifts; this is mediated by balancing ions during catharsis. In contrast, Agiolax (a senna-fiber mixture) mostly functions as a stimulant and bulk-forming agent with few reports of electrolyte influence [13]. In this study, there is an association between administration of both lactulose and PEG as laxative agents and the elevation of serum sodium levels. It is critical to establish whether statistically significant changes exceed clinically meaningful thresholds. In our study, both the lactulose and PEG groups had considerably higher blood sodium levels than the controls group; this suggested a possible mechanism where osmotic water loss occurs. This might be due to their capacity to cause electrolyte disturbances, especially when used for a long time without appropriate monitoring in geriatric patients. Severe diarrhea with preferential loss of free water over sodium and resultant hypernatremia may occur with the use of these agents. In addition, they stimulate the secretion of aldosterone, which increases the absorption of salt in the colon. They also promote renal salt retention by inhibition of natriuretic peptides. These mechanisms account for the hypernatremia that may be related to the prolonged administration of lactulose or PEG [15,16]. In addition, lactulose can be fermented in the colon and converted to organic acids such as lactic acid and acetic acid. When these acids combine with electrolytes to create an osmotic gradient, this will attract chloride and other ions toward the intestinal lumen [17]. This physiological mechanism is consistent with the results of the present study that showed a significant decrease of serum chloride with prolonged administration of lactulose could be associated with hypochloremia. While both other laxative (PEG and Agiolax) although both show statistically difference but the rang of serum chloride still within the normal value. In the geriatric age, hypokalemia carries significant risks; it can worsen constipation, cause muscle weakness, and precipitate fatal cardiac arrhythmias. In this study, the reduction in potassium levels in patient using Agiolax is most likely due to the senna component, which is a stimulant laxative that increases colonic output and motility. This process induces fecal potassium loss by increasing the secretion of both water and potassium into the intestines. This finding is consistent with the work by Kinnunen et al [18], as well as Bharucha and Lacy who showed that persistent use of stimulant laxatives can cause severe hypokalemia. Similarly, administration of lactulose in this study could be linked to a considerable fall in serum potassium levels [19]. This result not agrees with the finding of DiPalma et al which demonstrated that lactulose usage didn’t affect serum potassium level [20]. this result could be explained by that the, prolong usage of lactulose may lead to osmotic diarrhea in the geriatric age group, which lead to significant loss of potassium in stool together with e free water.

The decrease in serum potassium found in both the lactulose and Agiolax groups indicates an

important clinical vulnerability. In geriatric adults, relatively slight declines in serum potassium (< 3.5 mEq/L) can cross the minimal clinically important difference for cardiac safety. Given the fundamental cardiovascular comorbidities such as hypertension and heart failure these seemingly minor electrolytes alterations carry a large clinical risk of inducing cardiac arrhythmias or aggravating muscular weakness [21]. Interestingly, both serum sodium and potassium were flagged by the laboratory team and verified immediately by repeating the test on the same sample to ensure there were no typographical errors. The neurological manifest-ations such as lethargy and confusion that represented associated clinical presentation in elderly patients on chronic lactulose together with hypernatremia; the potent osmotic effect of lactulose can cause severe dehydration and subsequent electrolyte imbalances leading to alteration in mental state and confusion. This finding agrees with a case reported by Lee et al.; that demonstrated the high sodium levels can cause shifts in sodium that are incredibly harsh on the central nervous system [22]. On the other hand, Agiolax shows a different risk profile; the main clinical presentations of patients on Agiolax were cardiovascular manifestations such as orthostatic hypotension as the major constituent of Agiolax is senna, which acts as a stimulant component when prolonged or intensive use, could result in accelerated potassium loss that affects directly the electrical stability of the heart [23]. The clinical fingerprint of PEG was comparatively balanced. The PEG treated group showed the least amount of cardiovascular disturbance (20%), despite the fact that about half of them (52%) had some degree of CNS symptoms (52%). While several of the laxative treatment in this study causes statistically significant different changes, but the mean values of ESR for almost all treated groups remain near the normal physiological ranges which is below 20mm/hr. in male and below 30mm/hr. in female and no one of the laxative agent express severe inflammatory reaction which can be manifested by elevation of ESR above 50-100mm/hr. [24]. The explanation of minor increment of ESR level in lactulose treated patient may be related to the fact that lactulose is a synthetic sugar that could be fermented by the gut microbes that could causes mild-low grade intestinal mucosal irritation and lead to distension caused by gas/bloating, even though the increment of 25.8mm/hr. in the ESR still regarded as non-pathological elevation. On the other hand, PEG and Agiolax administration associated with reduction in the baseline -ESR in female, this could be related to fact that both Agiolax(psyllium/senna) and PEG act efficiently as laxative without bacterial fermentation so reduce mucosal irritation and systemic absorption of the endotoxin so lowering the baseline of ESR. The osmotic effect of lactulose that draw water and fluid from the blood stream to the bowel lumen which soften the fecal material, so prolong usage of lactulose causes loss of fluid moreover the old age has diminished thirst drive and reduction in total body water with continuous administration of laxative this lead to offset what lost in bowel and can causes uncompensated volume loss and dehydration that explained the elevation in blood urea in patient on lactulose in addition to that dehydration can lead to reduction in the renal blood flow, estimated GFR and elevation level of serum creatinine[25]. However, elevation of blood urea and serum creatinine is commonly related to muscle wasting (sarcopenia) and malnutrition in old age, which can dangerously mask underlying kidney disease. Although Agiolax work in different mechanism from that of lactulose as psyllium mechanically stimulate intestinal movement causes soft buck stool and the senna

causes direct stimulation of intestinal wall trigger its contraction and decrease water reabsorption in the colon [26]. This need plenty of water and fluid per day 150 ml /day and its should be not taken like other laxative for long time, chronic using of Agiolax without medical consultation and with adequate fluid per day could lead to severe dehydration that trigger volume depletion and pre-renal kidney strain [27]. There is no definitive proof indicating that PEG laxatives are substantially associated with increased CRP outcomes in terms of inflammatory indicators. Clinical studies typically showed that PEG is well-tolerated and does not lead to major adverse alterations in laboratory indicators [28]. However, in the present study, the patients on PEG showed a high level of CRP. This could be explained by that the chronic overuse of stimulant laxative or high doses of them can lead to localized drug-induced colitis or proctitis that is cross-similar to the inflammatory bowel disease and can cause mucosal inflammation [29,30]. In addition to that the elevation in the CRP might be related to underlying age-related chronic inflammation or other undiagnosed comorbidities in the geriatric patients rather than a direct inflammatory effect of the drug itself.

Conclusion

Prolonged use of lactulose is associated with dehydration and electrolyte imbalances (hypernatremia and hypokalemia) and deceptively elevation in serum creatinine and blood urea; however, future studies are needed to excluded other issues such as malnutrition in elderly which can dangerously mask underlying kidney disease. The PEG demonstrates the mildest metabolic profile, with its impact mostly limited to sodium levels. As this study is a comparative cross-sectional study there were no pre-treatment baseline biochemical and inflammatory values or longitudinal follow-up evaluation so all these finding are representing significant associations rather than direct causative effect between usage of the laxative and these changes in biochemical parameters so for more conformation a prospective longitudinal study need for ensure the causality

Recommended monitoring protocols (For more than three Month usage)

To safeguard geriatric patients, standard renal function panels should not be solely relied upon. The following routine clinical monitoring is recommended:

Electrolytes: Mandatory screening for serum electrolytes (especially potassium and sodium) every 3 to 6 months.

Renal function: Bypass standard creatinine measurements (due to the confounding effects of sarcopenia). Instead, use the estimated glomerular filtration rate determined by Cystatin C biomarker to correctly measure kidney integrity.

Screening: Screening for long-term Agiolax users should include regular nutritional screens, including pre-treatment serum folate levels, to identify latent malabsorption prior to frailty onset.

Routine monitoring recommendations: We have added an explicit recommendation protocol calling for scheduled 3–6-month electrolyte panels and the adoption of Cystatin C (instead of creatinine) for accurate renal monitoring in chronic laxative users.

Limitations of this study:

Observational design

The observational study can only show connections between laxatives and inflammatory indicators as well as serum creatinine, not prove cause and effect because the observed relationships may be influenced by hidden underlying variables or selection bias. Despite

these limitations, the observational design was necessary and highly valuable for the research and allowed the variables to be examined within a genuine, real-world clinical environment.

Center setting and absence of longitudinal follow-up

This study was conducted in a single place, which may limit the applicability of our findings to different geographic or demographic groups. Nonetheless, this setting maintained a high level of consistency in clinical practices and data gathering quality. However, the advantages of a single-center study are highly standardized protocols, uniform data gathering, and a constant care for patients setting, which eliminates institutional noise. In addition to that it is an academic center and the patients drainage form different location of the governorate.

Declaration of interests

The authors declare no competing interests.

Source of funding

Nil.

Conflict of interest: The authors declare no conflict of interest.

References

[1] Mooijaart S P. Improving the care for older emergency department patients: the Acutely Presenting Older Patient study. Z Gerontol. 2021;54(2):97–98.

[2] Kamal M, Negm WA, Abdelkader AM, Alshehri AA, El-Saber Batiha G, Osama H. Most common over-the-counter medications and effects on patients. Eur Rev Med Pharmacol Sci. 2023;27(4): 1654–1666.

[3] Pare P, Ferrazzi S, Thompson WG, Irvine EJ, Rance L. An epidemiological survey of constipation in Canada: definitions, rates, demographics, and predictors of health care seeking. Am J Gastroenterol. 2020; 96(11): 3130–3137.

[4] Mari A, Mahamid M, Amara H, Baker FA, Yaccob A. Chronic constipation in the elderly patient: updates in evaluation and management. Korean J Fam Med. 2020;41 (3):139–145.

[5] Bouras EP, Tangalos EG. Chronic constipation in the elderly. Gastroenterol Clin North Am. 2009;38(3):463–480.

[6] Zhang C, Liu Y, Zhang N, Shen J, Sang Y, Wang Y, et al. Prevalence and distribution of diarrhea and constipation among older adults aged 65 years and older – 31 PLADs, China, 2024. China CDC Wkly. 2026; 8(15):429–435.

[7] Rao SS, Go JT. Update on the management of constipation in the elderly: new treatment options. Clin Interv Aging. 2019; 14:163–171.

[8] Dimidi E. Dietary management of chronic constipation: a review of evidence-based strategies and clinical guidelines. Proc Nutr Soc. 2025;84(4):398–410.

[9] Liu LWC. Chronic constipation: current treatment options. Can J Gastroenterol. 2011;25 Suppl B:22B–28B.

[10] Leung L, Riutta T, Kotecha J, Rosser W. Chronic constipation: an evidence-based review. J Am Board Fam Med. 2011;24(4): 436–451.

[11] Li F, Fu T, Tong WD, Liu BH, Li CX, Gao Y, et al. Lubiprostone is effective in the treatment of chronic idiopathic constipation and irritable bowel syndrome: a systematic review and meta-analysis of randomized controlled trials. Mayo Clin Proc. 2016;91(4):456–468.

[12] Whorwell P, Lange R, Scarpignato C. Review article: do stimulant laxatives damage the gut? A critical analysis of curr-

ent knowledge. Ther Adv Gastroenterol. 2024;17:175.

[13] Komori S, Akiyama J, Tatsuno N, Yamada E, Hamada M, Izumi A. Prevalence and risk factors of constipation symptoms among patients undergoing colonoscopy: a single-center cross-sectional study. Digestion. 2024;105(4):299–309.

[14] Haring B, Pettinger M, Bea JW, Wactawski-Wende J, Carnahan RM, Ockene JK, et al. Laxative use and incident falls, fractures and change in bone mineral density in postmenopausal women: results from the Women's Health Initiative. BMC Geriatr. 2013;13(1):38.

[15] Adams DH. Sleisenger and Fordtran's gastrointestinal and liver disease. Gut. 2007;56(8):1175.

[16] Do C, Evans G, Deaguero J, Escobar G, Lin H, Wagner B. Dysnatremia in gastrointestinal disorders. Front Med. 2022;9:892265.

[17] Vičič V, Pandel Mikuš R, Ferjančič B. Review of history and mechanisms of action of lactulose (4-O-β-D-Galactopyranosyl-β-D-fructofuranose): present and future applications in food. J Food Sci Technol. 2024;61(11):2036–2045.

[18] Kinnunen O, Winblad I, Koistinen P, Salokannel J. Safety and efficacy of a bulk laxative containing senna versus lactulose in the treatment of chronic constipation in geriatric patients. Pharmacology. 1993;47 Suppl 1:253–255.

[19] Bharucha AE, Lacy BE. Mechanisms, evaluation, and management of chronic constipation. Gastroenterology. 2020;158(5):1232–1249.e3.

[20] DiPalma JA, Cleveland MV, McGowan J, Herrera JL. A randomized, multicenter, placebo-controlled trial of polyethylene glycol laxative for chronic treatment of chronic constipation. Am J Gastroenterol. 2007;102(7):1436–1441.

[21] Kim MJ, Valerio C, Knobloch GK. Potassium disorders: hypokalemia and hyperkalemia. Am Fam Physician. 2023; 107(1):59–70.

[22] Lee JH, Kim CS, Bae EH, Kim SW, Ma SK. Osmotic demyelination syndrome associated with hypernatremia caused by lactulose enema in a patient with chronic alcoholism. Electrolyte Blood Press. 2021; 19(1):15–18.

[23] Kardalas E, Paschou SA, Anagnostis P, Muscogiuri G, Siasos G, Vryonidou A. Hypokalemia: a clinical update. Endocr Connect. 2018;7(4):R135–R146.

[24] Özsoy Z, Bilgin E, Aksun MS, Eroğlu İ, Kalyoncu U. Extremely high erythrocyte sedimentation rate revisited in rheumatic diseases: a single-center experience. Turk J Med Sci. 2022;52:1889–1899.

[25] Klavan HL, Fortune BE. Elevated creatinine in a patient with cirrhosis. Clin Liver Dis. 2016;7(3):48–52.

[26] Nakagawa H, Sasai H, Kato Y, Matsumoto S. Exercise, dietary habits, and defecatory dysfunction in patients living with colorectal cancer: a preliminary quantitative study. Healthcare (Basel). 2024;12 (11): 1136.

[27] Lee EY, Yoon H, Yi JH, Jung WY, Han SW, Kim HJ. Does hypokalemia contribute to acute kidney injury in chronic laxative abuse? Kidney Res Clin Pract. 2015;34(2):109–112.

28. [28] Skaff C, Alayed T. Lethal complication from inappropriately prepared polyethylene glycol (GoLYTELY) in a pediatric patient. Cureus. 2021;13(3): e13713.

[29] Villanacci V, Casella G, Bassotti G. The spectrum of drug-related colitides: import-

ant entities, though frequently overlooked. Dig Liver Dis. 2011;43(7):523–528.

[30] Herlihy N, Feakins R. Gut inflammation induced by drugs: can pathology help to differentiate from inflammatory bowel disease? United European Gastroenterol J. 2022;10(5):451–464.