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Chronic kidney injury caused by unsupervised and unregulated self-medication of nonsteroidal anti-inflammatory drugs; a case report and literature review

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ABSTRACT

Self-medication is currently a growing global healthcare concern with varying degree of prevalence. Prolonged unsupervised self-medication can sometimes lead to adverse consequences. Our case report allows an in-depth examination of experience of a patient with unsupervised prolonged self-medication that caused an unfortunate adverse consequence. The case report identifies deficiencies in knowledge and practice concerning medication adherence, with a focus on the prolonged self-medication with analgesics. We are presenting here a case of self-medication and non-adherence to medical advice, which had resulted in chronic kidney disease (CKD) in a young male patient. The patient was admitted with rectal bleeding. Laboratory findings revealed elevated serum creatinine (2 mg/dL) and urine albumin-creatinine ratio of 121.7 mg/g indicating CKD as associated findings. However, the serum potassium was within normal range (4.5 mEq/L). During discharge the above parameters did not changed much (creatinine 1.9 mg/dL and serum potassium 4.7 mEq/L). However, the patient subsequently failed to attend the follow-up clinic at a regular interval. Instead, he continued self-medication with oral diclofenac sodium, a nonsteroidal anti-inflammatory drug (NSAID) to reduce toothache. The prolonged two years use of NSAIDs for toothache might have led to development of chronic renal failure. The finding from this case study highlights the importance regarding possession of basic knowledge about adherence to safe as well as supervised medication practice, and compliance to follow up.

Case Report

Implication for health policy/practice/research/medical education:
Education: Educational programs aimed at raising the awareness about the adverse impacts of self-medication may help to reduce this bad practice among the patients.
Practice: Enforcing the safe medicine practice will influence decision-making policies, protocols as well as interventional strategies to raise the awareness about the adverse impacts of self-medication.
Research: To acquire more data to defend such practice will drive conduction of further research on this topic to develop protocols and guideline on self-medication and adherence to follow up.
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Introduction

Self-medication is currently a growing global health concern (1). This entails the use of non-prescribed (i.e. over-the-counter) drugs as well as the prescribed drugs with divulge of advices. Self-medication is the practice of rampant and irrational use of drugs by the patients on their own initiative to alleviate symptoms without consulting any physician (2). Self-medication is commonly practised by patients for several conditions (such as quick relief from any pain, fever, common cold, allergic reactions or any infections), without waiting for being evaluated by a physician as this helps in reducing the cost of doctor's fee and waiting time (2). The potential risks of self-medications pose a significant threat to healthcare, as it can delay the diagnosis of medical conditions by masking symptoms. This condition often led to the progression of the primary disease, irreversible organ damage from medication side effects or prolonged use, and incorrect

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administration of inappropriate drugs. Ultimately, self-medication increases healthcare expenditure and affects patient safety (3). Effective use of medications benefits the patients in many ways apart from better management of the disease condition such as enhancing patients' knowledge, and self-esteem while promoting healthcare condition (4).

In the context of safety of vital systemic organs because of unsupervised self-medication, excessive use of painkillers especially nonsteroidal anti-inflammatory drugs (NSAIDs), antibiotics, antihistamines, herbal supplements, and many others can cause unnoticed yet irreversible damage to the kidneys at times leading to chronic kidney disease (CKD) (5). This case study explores how the excessive intake of NSAIDs caused CKD in a healthy, young patient who did not have any previous co-morbidity or causative factors predisposing to CKD. The purpose of reporting this case study is to create an awareness about the untoward hazard of unregulated over the counter use of NSAIDs. The occurrence of this case in current time proves that knowledge among the general population is still poor despite the fact that NSAIDs are well-known to cause kidney damage with prolonged use. Remembering the aphorism "one stitch in times saves nine", the health department as well as government should enforce the percolation of knowledge among the general people about the serious adversities of prolong use of NSAIDs as CKD can be life-threatening, difficult as well as expensive to manage.

In this case report, we will be detailing the patient's experiences during suffering from the complications of self-medication (6).

Case Presentation

A 22-year-old young man got admission to our hospital with complaints of bleeding from rectum along with accompanying generalised weakness. During further exploration of history, he mentioned that he was also passing frothy urine and was taking oral diclofenac frequently for last two years as unmonitored self-medication at a dose of 50 mg twice daily. On clinical examination, he was found pale but hemodynamically stable. His laboratory investigations revealed severe anemia (hemoglobin; 6.0 g/dL) along with raised serum creatinine (2 mg/dL), uric acid of 8.3 mg/dL, while his serum electrolytes and parathormone levels were within normal limits panel (sodium; 136 mEq/L, potassium; 4.5 mEq/L, chloride;104 mEq/L, calcium; 8.8 mEq/L, phosphorus; 4.0 mg/dL, and parathormone; 74.2 pg/mL). His routine urine tests revealed raised albumin (46.0 mg/L) and albumin: creatinine ratio of 121.7 mg/g. His calculated estimated glomerular filtration rate (eGFR) was 54.6 mL/min/1.73 m^2. An urgent upper and lower gastro-intestinal endoscopy were performed which revealed an ulcer in the distal part of the descending colon. The patient was referred to the nephrology clinic for an urgent biopsy of kidney, which revealed chronic ischemia of renal cortex and moderate degree of fibrosis with atrophic changes in the renal tubules indicating occurrence of chronic renal failure. Serum iron evaluation as well as peripheral blood smear examination revealed iron deficiency anemia. His past medical history revealed that he had severe pain from an impacted wisdom tooth for last two years. He took a course of co-amoxiclav, 625 mg thrice daily for five days and diclofenac 50 mg, twice daily for seven days, as per advice of the dentist. As his pain continued, to avoid surgery and that induced apprehension, the patient did not follow up with his dentist, rather continued to take diclofenac as and when necessary for pain relief on his own. This condition was continued for more than two years until he took admission in the hospital for rectal bleeding. He did not have any other medical illness. Hence, he was provisionally diagnosed as a NSAID overuse induced lower gastro-intestinal bleeding, further use of diclofenac was stopped immediately. Meanwhile, pantoprazole 40 mg once daily through intravenous route was started for gastro-intestinal protection. Twelve days later, his serum creatinine improved to 1.9 mg/dL and he was discharged from the hospital with the advice to attend the nephrology clinic monthly. During first two follow-up visits, his creatinine levels were 1.6 mg/dL and 1.7 mg/dL, respectively.

Discussion

The findings of this case report indicate that prolonged self-medication with diclofenac led to development of CKD, which is well described in literature (7). Based on the findings from this case, we can clearly delineate three basic elements in development of self-medication induced CKD. These include long-term exposure of a known nephrotoxic drug, higher tendency of self-medication and non-compliance to medical supervision in younger patients, and apprehension and anxiety for surgery, leading to prolonged reliance on harmful nephrotoxic medications. Combination of all these factors in young age group can be explained with Rosenstock's 'health belief model' (8). The health belief model (HBM) provides a valuable framework for understanding the intricate interactions among psychological and social factors. This model can be used to explain the health behaviours and related actions of an individual (9). The HBM comprises six elements: 'perceived susceptibility', 'perceived severity', 'perceived benefits', 'perceived barriers', 'perceived self-efficacy' and 'cues to action' (9). These elements interact to explain an individual's choice of health behaviors and related actions. The model proposes that a person's health-related behaviours depend on the person's perception of certain critical areas as follows (10).

Perceived susceptibility indicates about the individual's assessment regarding seriousness of the illness and unwanted outcome (11). Absence of follow up visit and self-medication have the potential of adverse events.

Perceived severity reflects how a person see a health problem and realizes about the unwanted outcome (12). In this case, the patient had inadequate knowledge about renal injury that may occur from inappropriate intake of diclofenac, its irreversibility and effect on the quality of life. The combination of susceptibility and severity constitutes the 'level of readiness' of an individual that motivates to make a change in health behaviour (13). Perceived benefits means an individual's assessment of the positive consequences of adopting the appropriate actions. For this patient, treatment from a dentist could effectively relieve the toothache. Perceived barriers reflects an individual's assessment that discourages adopting any appropriate action or behaviour. Here, the person considered the treatment from a dentist to be painful, unpleasant and upsetting. This led to the motive of avoidance to dentist, a negative health action. To initiate a health behaviour change, an individual must believe that the perceived benefits are greater than the perceived barriers (13). In the context of this reported case, the 'perceived barriers' to taking action i.e., apprehension of tooth extraction, lack of supportive personnel, and pressure of curriculum outweigh the 'perceived benefits' of taking action (treatment from a dentist). Here, the 'perceived self-efficacy' was poor due to inadequate knowledge regarding kidney disease, tender age and lack of social support (14). The 'cues to action' reflects the factor that serves as a 'cue' or a 'trigger' to activate the appropriate action (8). A nurse-led awareness program and adequate family support could play an important role in promoting change in health behaviour (15).

Self-medication and non-adherence to regular medical follow-ups can increase the risk to the development of chronic renal failure. In a previous study, authors have observed that long-term use of NSAIDs can lead to CKD, particularly in younger patients, without having any underlying co-morbidities. They emphasized the need for controlled use of NSAIDs due to their potential nephrotoxicity (16). Moreover, the author emphasized that use of NSAIDs additionally can lead to gastrointestinal ulceration, perforation, hepatic impairment, cardiovascular ailments, and thrombotic events in addition to the renal impairment (16). Authors of another study also highlighted that NSAIDs can also precipitate other kidney complications such as, acute kidney injury, acute interstitial nephritis, and electrolyte imbalances (17).

The irrational use of self-medication was found to be significantly high among the young college students (18) and most of the individuals engaging in self-medication belong to the 18-30 years of age (19). The inappropriate self-medication practices observed among adolescents may negatively affect their health. Authors of another study reported that other factors such as time-savings, hospital-related anxiety, prior use of self-medication, easy availability of over-the-counter drugs, and advice from the family members also lead to practice of self-medication among these individuals (20). Furthermore, in another study, authors found that the willingness of college students to consult health practitioners regarding health issues were extremely low, which leads to the tendency of self-medication (21). A recent study concluded that judgment and self-care abilities among the adolescent age group remained lower compared to the adults, making them more vulnerable to indulge in self-medication (22). Hence, health education on self-medication is crucial in this people to avoid the bad health practice.

The practices of self-medication with paracetamol, antibiotics, and NSAIDs remained high among the nursing and medical students despite having the knowledge of adversities of these medications (20,23). Self-medication practices were more common among the fifth year medical students compared to their first year counterparts (23). In the present study, the educational level of the patient was high. A recent study indicates that self-medication practices are more common among patients with higher educational background (24). In that study, authors also identified several reasons such as the perception of saving time, the belief that the illness is mild, previous positive experiences with the same medications, and the urgency of situations with poor access to healthcare as well as long waiting time and incurring cost (24). These factors are also consistent with our case. In a more recent study, authors demonstrated that students frequently practices self-medication with easily available over-the-counter drugs (25). The drug of self-medication in this study concords with a recent published study where authors concluded that analgesics are the most commonly used drugs in self-medication (26). NSAIDs are well-known to implicate with renal dysfunction especially when used for longer duration and with higher dose (27). Table 1 depicts overview of some recent reported case studies about the use of different NSAIDs and renal dysfunction.

The World Health Organization (WHO, 2019) emphasized that a formal medication review is crucial in optimizing patients' health outcomes. This review-process identifies concomitant drug interactions and adverse reactions of the medications. The review is particularly relevant when over-the-counter medicines, such as NSAIDs are used especially for patients with pre-existing kidney issues as they can exacerbate the renal damage and interact with other drugs (34).

Conclusion

Although self-medication is a component of self-management of chronic illnesses, such improper practices can worsen the disease on the long run. A structured and collaborative approach to self-management, particularly in patients with kidney impairment, may help to delay further disease progression and thereby improve prognosis. Based on this case study, the researcher developed a self-management module for CKD patients

Table 1. Recent published case reports on NSAIDs-induced renal injury

Authors/year	Age/Gender	Clinical presentation	Past medical history with medication
Babladi et al, 2019 (28)	65 years/ male	Bilateral pedal edema for 15 days, Facial puffiness-7 days	The patient has been taking tablet Diclofenac for three years, first for Chikungunya, then as needed for two years, followed by daily or on alternate days since last year, for knee pain.
Jeon et al, 2019 (29)	37 years/ woman; with cholestasis during pregnancy	Raised creatinine (1.73 mg/dL), bilateral renal hypoperfusion on USG and CT scan	Received intravenous ketorolac 60 mg, and ibuprofen 600 mg 4 times daily for 6 days to relieve acute-on chronic right upper quadrant pain. The authors postulated NSAID related renal ischemia.
Chandana et al, 2022 (30	68 years/ male	Admitted with vomiting and breathlessness for 4 days, pain abdomen for last 5 days, heart burn, burning micturition, and hematuria for last 2 weeks.	Receiving combination of diclofenac sodium and acetaminophen (50 mg+500 mg) once daily for last 8 years to alleviate knee pain due to 'wind-swept deformity' –an entity with valgus deformity in one knee and varus alignment in the other.
Shah et al, 2021 (31)	15 years/ female	Acute onset of bilateral pedal edema, fatigue and weight gain. Diagnosed as Nephrotic syndrome based on hypoalbuminemia, hyperlipidemia, and excessive proteinuria	Intermittently took tab. Ibuprofen 1600 to 2400 mg/d, for the last 6 months to manage menstrual cramps and lower abdominal pain. The urinary albumin-to-creatinine ratio was raised to 5229 mcg/mg of creatinine.
Liu et al, 2021 (27)	67 years/male	Anasarca, Shortness of breath, bilateral pitting pedal edema, orthopnoea, nausea, vomiting, diarrhoea, scanty and frothy urine	Tab Ibuprofen 400 mg thrice or 4 times daily for 9 months, thereafter 200 mg once daily for 10 months to alleviate chronic bilateral osteoarthritis of knees. Additional comorbidities were hypertension and hyperlipidemia.
Ghimire et al, 2023 (32)	66 years/male	Lethargy, increased confusion, normal anion gap metabolic acidosis, eGFR mildly reduced (76 mL/ min/1.73 m^2	Tab Ibuprofen 200 mg plus methocarbamol 500 mg (80 tablets within a month) for relief of chronic back pain.
Adithya et al, 2024 (33)	53 years/ female	Came to gastroenterology Outpatient Department for routine review	Received aceclofenac and paracetamol frequently for unknown duration to alleviate toothache. She is known patient of chronic liver disease- 8 months, with hypothyroidism for last 2 years.

to increase the awareness and to educate the patients regarding the unsafe healthcare practice.

Limitations of the study

This case report has certain limitations. First, the case history was retrieved retrospectively long time after the drug exposure has caused the damage, which is well known to implicate potential recall bias. Patient's age, socioeconomic status, pre-existing beliefs, education and self-report errors may also have added some bias. Moreover, the present case report reflects data derived from only one patient and that too belongs to the young age group which restrict from generalizing this impact in all population. The association of drug exposure and development of disease warrants careful interpretation for generalization in elderly population or in other geographical area.

Authors' contribution

Conceptualization: Suchitra Pal, Santhna Letchmi Panduragan, Faridah Mohd Said.
Data curation: All authors.
Formal analysis: All authors
Methodology: All authors.
Project administration: Santhna Letchmi Panduragan, Faridah Mohd Said.
Supervision: Santhna Letchmi Panduragan, Faridah Mohd Said.
Writing–original draft: All authors.
Writing–review & editing: All authors.

Ethical issues

This case report was conducted in accordance with the World Medical Association Declaration of Helsinki. The patient provided written informed consent for the publication of this case report. Ethical issues (including plagiarism, data fabrication, double publication) have been completely observed by the authors.

Conflicts of interest

The authors declare that they have no competing interests.

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References

1. Al-Omrani H, Marwah MK, Al-Whaib R, Mekkawy M, Shokr H. Patterns of drug utilization and self-medication

practices: a cross sectional study. Pharmacy (Basel). 2023;11:183. doi: 10.3390/pharmacy11060183.
2. Zheng Z, Feng Z, Zhang D, Sun X, Dong D, Luo Y, et al. Does self-medication reduce medical expenditure among the middle-aged and elderly population? A four-wave longitudinal study in China. Front Public Health. 2022;10:1047710. doi: 10.3389/fpubh.2022.1047710.
3. Ruiz ME. Risks of self-medication practices. Curr Drug Saf. 2010;5:315-23. doi: 10.2174/157488610792245966.
4. van Herpen-Meeuwissen LJ, van Onzenoort HA, van den Bemt P, Maat B, van den Bemt BJ. The effect of self-administration of medication during hospitalization on patient's self-efficacy and medication adherence after discharge. Patient Prefer Adherence. 2022;16:2683-93. doi: 10.2147/ppa.S375295.
5. Roy PJ, Weltman M, Dember LM, Liebschutz J, Jhamb M. Pain management in patients with chronic kidney disease and end-stage kidney disease. Curr Opin Nephrol Hypertens. 2020;29:671-80. doi: 10.1097/mnh.0000000000000646.
6. Crowe S, Cresswell K, Robertson A, Huby G, Avery A, Sheikh A. The case study approach. BMC Med Res Methodol. 2011;11:100. doi: 10.1186/1471-2288-11-100.
7. Drożdżal S, Lechowicz K, Szostak B, Rosik J, Kotfis K, Machoy-Mokrzyńska A, et al. Kidney damage from nonsteroidal anti-inflammatory drugs-Myth or truth? Review of selected literature. Pharmacol Res Perspect. 2021;9:e00817. doi: 10.1002/prp2.817.
8. Rosenstock IM. Why people use health services. Milbank Q. 2005;83:10.1111/j.1468-0009.2005.00425.x. doi: 10.1111/j.1468-0009.2005.00425.x.
9. Alyafei A, Easton-Carr R. The health belief model of behavior change. In: StatPearls [Internet]. Treasure Island, FL: StatPearls Publishing; 2025. Available from: https://www.ncbi.nlm.nih.gov/books/NBK606120/. Updated May 19, 2024. Accessed March 12, 2025.
10. Rejeski WJ, Fanning J. Models and theories of health behavior and clinical interventions in aging: a contemporary, integrative approach. Clin Interv Aging. 2019;14:1007-19. doi: 10.2147/cia.S206974.
11. Norman P, Conner M. Health behavior. In: Reference Module in Neuroscience and Biobehavioral Psychology. Elsevier; 2017. p. 1-27. doi: 10.1016/b978-0-12-809324-5.05143-9.
12. Green EC, Murphy EM, Gryboski K. The health belief model. In: Sweeny K, Robbins ML, Cohen LM, eds. The Wiley Encyclopedia of Health Psychology. John Wiley & Sons; 2020. p. 211-4.
13. Conley CE, Olson AD, Howard JS, Dressler EV, Lattermann C, Mattacola CG. Use of an adaption to the health belief model to influence rehabilitation adherence in athletic training. Athl Train Sports Health Care. 2018;10:10-9. doi: 10.3928/19425864-20170811-01.
14. Schrauben SJ, Cavanaugh KL, Fagerlin A, Ikizler TA, Ricardo AC, Eneanya ND, et al. The relationship of disease-specific knowledge and health literacy with the uptake of self-care behaviors in CKD. Kidney Int Rep. 2020;5:48-57. doi: 10.1016/j.ekir.2019.10.004.
15. Chen CC, Chen Y, Liu X, Wen Y, Ma DY, Huang YY, et al. The efficacy of a nurse-led disease management program in improving the quality of life for patients with chronic kidney disease: a meta-analysis. PLoS One. 2016;11:e0155890. doi: 10.1371/journal.pone.0155890.
16. Lucas GN, Leitão AC, Alencar RL, Xavier RM, de Francesco Daher E, da Silva Junior GB. Pathophysiological aspects of nephropathy caused by non-steroidal anti-inflammatory drugs. J Bras Nefrol. 2019;41:124-30. doi: 10.1590/2175-8239-jbn-2018-0107.
17. Baker M, Perazella MA. NSAIDs in CKD: are they safe? Am J Kidney Dis. 2020;76:546-57. doi: 10.1053/j.ajkd.2020.03.023.
18. Noblin A, Gabriel MH, Cortelyou-Ward K, Holmes K. Health literacy among visiting college students in the US: a pilot study. J Am Coll Health. 2022;70:589-97. doi: 10.1080/07448481.2020.1758114.
19. Fathima F, Arpitha VS, Nayak R. Self-medication practices among adults of north Karnataka. Int J Community Med Public Health. 2022;9:4588-94. doi: 10.18203/2394-6040.ijcmph20223217.
20. Faqihi A, Sayed SF. Self-medication practice with analgesics (NSAIDs and acetaminophen), and antibiotics among nursing undergraduates in University College Farasan Campus, Jazan University, KSA. Ann Pharm Fr. 2021;79:275-85. doi: 10.1016/j.pharma.2020.10.012.
21. Alshogran OY, Alzoubi KH, Khabour OF, Farah S. Patterns of self-medication among medical and nonmedical university students in Jordan. Risk Manag Healthc Policy. 2018;11:169-76. doi: 10.2147/rmhp.S170181.
22. Lambourg E, Colvin L, Guthrie G, Walker H, Bell S. Analgesic use and associated adverse events in patients with chronic kidney disease: a systematic review and meta-analysis. Br J Anaesth. 2022;128:546-61. doi: 10.1016/j.bja.2021.08.035.
23. Daanish AF, Mushkani EA. Influence of medical education on medicine use and self-medication among medical students: a cross-sectional study from Kabul. Drug Healthc Patient Saf. 2022;14:79-85. doi: 10.2147/dhps.S360072.
24. Rathod P, Sharma S, Ukey U, Sonpimpale B, Ughade S, Narlawar U, et al. Prevalence, pattern, and reasons for self-medication: a community-based cross-sectional study from central India. Cureus. 2023;15:e33917. doi: 10.7759/cureus.33917.
25. Bustanji Y, Taneera J, Bargooth A, Abuhelwa A, Issa A, El-Huneidi W, et al. Exploring the global landscape of self-medication among students: trends, risks, and recommendations for safe and responsible practices. Pharm Pract. 2024;22:1-14. doi: 10.18549/PharmPract.2024.1.2928.
26. Alwhaibi M, Bin Malik S, Alswailem L, Alruthia Y. Self-medication among adults with chronic health conditions: a population-based cross-sectional survey in Saudi Arabia. BMJ Open. 2023;13:e069206. doi: 10.1136/bmjopen-2022-069206.
27. Liu AC, Chang Y, Zuckerman JE, Kalantar-Zadeh K, Ghobry LM, Hanna RM. Ibuprofen-associated minimal change disease and acute interstitial nephritis with possibly linked membranous glomerulonephritis. SAGE Open Med Case Rep. 2021;9:2050313x211025145. doi: 10.1177/2050313x211025145.
28. Babladi VP, Patil N, Manjunath G, Salimath PV, Ninne SR, Chary KM. A case report on diclofenac induced chronic kidney disease. Indian J Pharm Pract. 2019;12:129-32. doi:

10.5530/ijopp.12.2.27.
29. Jeon Y, Lis JB, Chang WG. NSAID associated bilateral renal infarctions: a case report. Int J Nephrol Renovasc Dis. 2019;12:177-81. doi: 10.2147/ijnrd.S212010.
30. Chandana C, Anusha S, Kavya HB. Diclofenac induced rapidly progressive renal failure in elderly patient–a case report. Indian J Pharm Pract. 2022;15:315-7. doi: 10.5530/ijopp.15.4.56.
31. Shah S, Elder MA, Hata J. Case report: a rare presentation of NSAID-induced secondary membranous nephropathy in a pediatric patient. Front Pediatr. 2021;9:670575. doi: 10.3389/fped.2021.670575.
32. Ghimire A, Li D, Amin L. Ibuprofen-induced renal tubular acidosis: case report on a not-so-basic clinical conundrum. Can J Kidney Health Dis. 2023;10:20543581231183813. doi: 10.1177/20543581231183813.
33. Adithya SL, Iyer SG, Shanavas NM, Shaiju S Dharan SS, Dharman D. NSAID induced acute kidney injury (AKI): a case study. Int J Pharm Sci. 2024;2:1262-7. doi: 10.5281/zenodo.10899139.
34. World Health Organization (WHO). Medication Safety in Polypharmacy (WHO/UHC/SDS/2019.11). Geneva: WHO; 2019. Available from: https://www.who.int/docs/default-source/patient-safety/who-uhc-sds-2019-11-eng.pdf.