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Guest Editorial

Can increasing the number and role of community pharmacists in South Africa help address rising antimicrobial resistance rates, and what are the implications?*

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Abstract

Antimicrobial resistance (AMR) is a critical issue globally as well as in South Africa, exacerbated by concerns with inappropriate antibiotic use in primary care. This includes prescribers in South Africa with variable dispensing of antibiotics without a prescription. Where this does occur, this is principally for patients with urinary tract infections (UTIs), including those associated with sexually transmitted infections (STIs), and STIs. There is little dispensing of antibiotics without a prescription for self-limiting conditions including upper respiratory tract infections (URTIs). Community pharmacists in South Africa typically offer symptomatic relief first for patients presenting with URTIs unlike prescribers. In view of this, coupled with the key role that community pharmacists played during the COVID-19 pandemic, and the fact that in a number of countries trained community pharmacists can diagnose and dispensed antibiotics for certain infections including UTIs, we believe it is time for the South African Government and Health Authority to review current legislation and expand the services of community pharmacists. An increased number of community pharmacists can also work with prescribers to improve their antibiotic use, building on examples in South Africa and across developing countries. This paper summarises published evidence to promote an increasing role for community pharmacists in the country to reduce AMR, and the suggested next steps to take this debate forward. We believe this is essential if South Africa is to effectively tackle rising AMR rates.

Keywords: antimicrobial resistance, community pharmacists, national action plan, self-purchasing antibiotics, pharmacist dispensing, South Africa

https://doi.org/10.36303/SAPJ.3898

* As Editor of the ***South African Pharmaceutical Journal*** (SAPJ), I have invited this guest editorial to spotlight an urgent national crisis during World AMR Awareness Week 2025 (18–24 November), themed "*Act Now: Protect Our Present, Secure Our Future*". South Africa's AMR National Strategy Framework (2018–2024) has lapsed without renewal, prompting an open letter from over 70 experts to Minister Dr Aaron Motsoaledi urging reinstatement amid rising AMR threats to NHI and health security, with global projections of 40 million deaths in 25 years. This editorial, co-authored by other scientists, synthesises evidence positioning community pharmacists as underutilised stewards: they already prioritise symptomatic care for self-limiting infections unlike primary care prescribers. It proposes four interlinked reforms: recognise pharmacists as AWaRe-aligned AMS partners in national structures; expand PCDT and scoped prescribing for UTIs/STIs; strengthen pharmacist–prescriber data-driven AMS; and align workforce planning to deploy unemployed pharmacists against AMR while improving access. These actionable steps operationalise WHO Global Action Plan priorities for South Africa.

Introduction

Antimicrobial resistance (AMR) is a critical public health concern across all countries leading to increased morbidity, mortality and costs.[1-7] The associated costs also include the social burden arising from AMR, which has been under-recognised to date.[8] The highest AMR prevalence rates globally are currently seen among low- and middle-income countries (LMICs) including among African countries.[1,9-11] AMR is fuelled by high rates of inappropriate prescribing and dispensing of antibiotics, including antibiotics from the World Health Organization (WHO) Watch and Reserve list with their greater resistance potential.[12-15] For instance in 2022 alone, more than 659,000 children in Africa and more than 752,000 children in Southeast Asia died of AMR-associated complications, with many of these deaths linked to increasing use of Watch and Reserve antibiotics.[16] Utilisation of Watch antibiotics increased by 126%, with similar increases for Reserve antibiotics, in this population between 2019 and 2021, driving up AMR-associated deaths.[16]

A key area of concern among LMICs driving up AMR rates are consistent high levels of dispensing of antibiotics without a prescription, including from the WHO Watch list.[17-20] These high rates have persisted despite ongoing legislation banning such activities.[17,18] High rates are exacerbated by pressure from patients with often limited knowledge of antibiotics and AMR, previous successful experiences with antibiotics including for viral self-limiting conditions including upper respiratory tract infections (URTIs), their infections seen as minor, often long waiting times and costs to see healthcare professionals (HCPs) in primary healthcare clinics (PHCs) as well as the costs of medicines, compared with the convenience of community pharmacies.[17,21-24] South Africa is no exception with high rates AMR, impacting on mortality, alongside high rates of inappropriate antibiotic use across all sectors including primary care (Supplementary Table S1).[25-31] Primary care is critical in this respect as this sector can account for up to 95% of total antibiotic use in humans in LMICs.[32] If not addressed, global mortality from AMR is estimated to reach 1.91 million (1.56–2.26) deaths attributable to AMR by 2050, and 8.22 million (6.85–9.65) deaths associated with AMR by 2050, with up to 4.1 million AMR-related deaths alone in sub-Saharan Africa.[33-34] These projected increases in sub-Saharan Africa have resulted in calls to rapidly instigate multiple activities to urgently address the situation.[35]

There are ongoing Global, Regional and National initiatives to reduce the prevalence and burden of AMR. These include the WHO Global Action Plan (GAP) to reduce AMR in 2015, subsequently developed into National Action Plans (NAPs).[36-39] However, there are ongoing concerns with the implementation of NAPs among LMICs, including among African countries, due to issues with available resources and personnel to instigate agreed activities.[37,38,40-42] South Africa has also developed and launched its NAP.[43,44] However, similar to other LMICs, there are ongoing concerns regarding the implementation of its NAP, which has resulted in approaches to the Ministry of Health to urgently address the situation.[44-46] Recent activities include an open letter from academic researchers, infectious diseases specialists, infection prevention practitioners, microbiologists, pharmacists, pharmacologists, public health experts, and policy experts in the field of AMR to the Minister of Health in June 2025 to prioritise the development and implementation of the NAP.[46] Other WHO initiatives include encouraging greater monitoring of AMR patterns to improve future empiric prescribing through the WHO GLASS initiative.[47,48] In addition, the development of the WHO AWaRe classification and guidance aiming to increase the use of Access antibiotics where antibiotics are necessary with their lower resistance potential.[49-51] Alongside this, encouraging initial non-antibiotic treatments for self-limiting conditions such as URTIs.[50,51] WHO AWaRe guidance is welcomed as there have been concerns with the robustness of a number of antibiotic guidelines produced in LMICs.[52] The initial target was that at least 60% of antibiotic use across sectors should be Access antibiotics.[49,53] However, this has increased to 70% following the United Nations General Assembly (UN GA) high-level meeting on AMR in September 2024.[54,55]

Recent global discussions, including surrounding the recent UN GA high level meeting on AMR, have highlighted that in many LMIC settings strict enforcement of prescription only policies for antibiotics is often not feasible as a result of weak enforcement, workforce shortages, shortages of antibiotics in PHCs, access barriers to see HCPs in PHCs and entrenched informal antibiotic markets.[21,56-58] It is increasingly argued that unregulated access to antibiotics without a prescription should be understood as a symptom of available resources and primary care health system constraints, and that community pharmacists in particular need to be integrated into regulated, algorithm-guided, AWaRe-aligned models of care to improve future antibiotic use, which builds on their skills demonstrated during the COVID-19 pandemic.[59-63] This broader framing is particularly relevant for South Africa, where high AMR rates, gaps in NAP implementation and persistent inequities in access to primary care coexist with under utilised pharmacy capacity.[56,64] Trained community pharmacists can also reduce the extent of substandard and falsified antibiotics within their pharmacies, which is a concern across Africa adding to AMR.[57,65,66] However, to date, this appears to be less of an issue in South Africa compared with other African countries and other LMICs.[57,67,68] The informal sector, which can also add to AMR, is again less of an issue in South Africa compared with other African countries and other LMICs.[57,58]

Antimicrobial stewardship (AMS) activities are urgently needed in South Africa to improve future prescribing and reduce AMR.[46] This includes addressing continued concerns with low levels of knowledge regarding antibiotics and AMR among prescribers in primary care as well as high levels of inappropriate prescribing of antibiotics (Supplementary Table S1).[69-74] There are a growing number of antimicrobial stewardship programs (ASPs) being undertaken among African countries, including South Africa, to try and improve future use given ongoing concerns, and this is likely to continue given rising AMR rates.[21,27,75,76]

There has generally been limited dispensing of antibiotics without a prescription in South Africa compared with other African countries in published studies.[18,77-80] Where this occurs, this has generally been from Independent as opposed to Chain pharmacies, and typically

for patients with urinary tract infections (UTIs) suggestive of sexually transmitted infections (STIs) or for STIs.[79] There has generally been very limited dispensing of antibiotics without a prescription in South Africa for patients with URTIs, with usually symptomatic treatment offered first in accordance with WHO AWaRe guidance, which contrasts with the situation with prescribers (Supplementary Table S1).[50,80-82] This is important given concerns with the overuse of antibiotics to treat URTIs across LMICs where symptomatic treatment should be offered first.[21,50,83-86]

Taken together, this suggests that South African community pharmacists are already acting, to some extent, as de facto stewardship partners in the management of self-limiting infections, even as broader system weaknesses continue to drive inappropriate antibiotic use and AMR. This is encouraging. However, we are aware that there are currently sub-optimal numbers of pharmacists working in the public sector in South Africa providing patient care and guidance to prescribers alongside high levels of unemployment among community pharmacists.[64,87,88] This needs to be urgently addressed to improve future antibiotic use in the country given, as mentioned, high rates of AMR and the implications.[30,46] In view of this, there is a need to document experiences across countries where community pharmacists are allowed to prescribe antibiotics, provide guidance and support to prescribers as well as patients, and assess their impact to reduce inappropriate antibiotic use. This reflects the growing recognition of the value that community pharmacists can bring to improving patient care in LMICs at a time of increasing pressures on available resources.[59,89,90] The findings can provide future direction to all key stakeholders in South Africa given current challenges. This was the aim and objective of this editorial.

Approach

A narrative review approach was undertaken for the content of this editorial to allow for a broader scope of sourced papers as pertinent information contained within identified papers may be part of broader papers. In addition, key documents and information may only be available via the Internet or in Journals not covered by Pub Med or Web of Science; consequently, would typically be excluded from systematic reviews. We are aware this approach may lead to bias. However, the co-authors have considerable experience in this area including providing guidance to all key stakeholder groups across LMICs on ways to appreciably reduce inappropriate antibiotic use.[15,18,21,57,75,84,91-95] We believe this is important given ongoing concerns with AMR in South Africa and the implications, with the principal aim of this editorial to suggest potential ways forward for all key stakeholder groups to enhance the utilisation of community pharmacists to reduce AMR in South Africa.[30,46]

Data from included papers were extracted into summary tables capturing country, year, setting, intervention type and key outcomes, and ordered chronologically where pertinent. The principal authors (TM and BG) synthesised the material thematically, focusing on: (i) pharmacist prescribing for selected infections where this occurs; (ii) community pharmacy-based AMS interventions to reduce unnecessary antibiotic dispensing; and (iii) pharmacist–prescriber partnerships to optimise prescribing, with emphasis on lessons relevant to South Africa (Supplementary Tables 2–4). Key findings were documented by the principal authors (TM and BG) as part of the synthesis, similar to other recent approaches involving these authors.[18,21,57,75]

International evidence and implications for South Africa

International experience demonstrates that community pharmacists can safely manage selected infections including UTIs, reduce unnecessary antibiotic use and contribute to AMS activities when appropriately trained, supported and integrated into primary care systems.

Three main domains emerge from the international literature. These include pharmacists diagnosing and prescribing antibiotics for uncomplicated infections (Supplementary Table S2), AMS oriented interventions to reduce inappropriate dispensing of antibiotics without a prescription among patients (Supplementary Table S3), and pharmacist–prescriber partnerships to optimise antibiotic prescribing in primary care (Supplementary Table S4).

Supplementary Table S2 contains details of programmes across multiple countries, including Canada, New Zealand and the United Kingdom, where community pharmacists have been authorised to treat a range of infectious diseases with antibiotics including UTIs.[96-100] We are also aware in France that community pharmacists are now allowed to dispense antibiotics for patients with UTIs.[101] However, they must belong to a coordinated structure and have previously obtained the agreement of the referring physician, with studies ongoing to assess their impact on subsequent patient care in controlled, cluster-randomised studies.[101]

For such initiatives to succeed in other countries, identified barriers must be addressed.[100,102] These include fostering a favourable socio-political context including developing clear policy pathways and logistics, instigating targeted training courses for community pharmacists to address potential shortcomings in necessary diagnostic and other skills, and raising key stakeholder recognition of the potential role for community pharmacists to be able to prescribe antibiotics in certain situations.[100-102] Alongside this, allocating specific resources and updating infrastructures to improve patient care.[100,102]

Supplementary Table S2 contains details of published studies where community pharmacists have provided advice to patients on the appropriate management of their infectious disease, especially aimed at reducing their requests to dispense antibiotics for essentially self-limiting conditions. As a result, recognising community pharmacists as critical to improve antimicrobial use in primary care across LMICs. ASPs have historically been more difficult to undertake among LMICs due to issues with personnel, available resources, weak infrastructures and inadequate antimicrobial resistance surveillance.[103-105] However, this is changing among LMICs, including among African countries, providing direction for the future.[21,27,75,106-109] Overall, appropriately trained community pharmacists integrated into current health care systems can make an appreciable impact in minimising inappropriate antibiotic use among LMICs (Supplementary Tables S3 and S4).[110,111] This includes working alongside prescribers in LMICs to improve their future antibiotic prescribing through auditing, feedback and other activities.[88,112]

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Table I: Proposed inter-related activities for all key stakeholder groups going forward to enhance antibiotic use in primary care in South Africa

Inter-related activity	Rationale and ways forward
Recognising trained community pharmacists as core AMS partners within an AWaRe-aligned national response	• The emerging evidence from South Africa indicates that community pharmacists generally demonstrate comparatively conservative antibiotic use for self limiting infections such as URTIs, often prioritising symptomatic management over antibiotics[79-81,119] • This is in contrast to current prevailing prescribing patterns in primary care in South Africa (Supplementary Table S1), perpetuating ongoing concerns regarding AMR in South Africa • Consequently, rather than positioning community pharmacies primarily as enforcement targets, future policies in South should formally acknowledge their de facto stewardship contribution, including educating patients (Supplementary Table S3), and integrate them into provincial and district AMS structures as well as into any reconstituted national AMR advisory arrangements, e.g. a reinstated Ministerial Advisory Committee on AMR. • This implies using pharmacy generated data in the future to track alignment of antibiotic use with WHO AWaRe Guidance and UN-GA targets,[50,51,54] which could include instigating and monitoring agreed quality indicator targets based on AWaRe[120] • Such activities will necessarily involve community pharmacists in the design and delivery of public and patient education on antibiotic use, and ensure that SAPC pharmacy representatives have a voice in future national AMR planning and monitoring processes building on their skills
Expand antimicrobial-stewardship oriented PCDT and pharmacist prescribing for selected infections in South Africa	• International experience, particularly from Canada, New Zealand and the United Kingdom, demonstrates that suitably trained community pharmacists can safely manage uncomplicated UTIs and similar conditions under protocol, achieving high clinical cure rates, high patient satisfaction, reduced pressure on primary care and emergency care, as well as reduced costs (Supplementary Table S2) • Currently in South Africa, North West University remains the only accredited provider of the PCDT supplementary qualification, and no other institution currently has concrete plans for comparable programmes.[121] This represents a missed opportunity given the country's growing AMR burden and the acknowledged need to shift care for selected infections into community settings to improve patient access • In line with the recent comments, and in collaboration with SAPC, we propose that national stakeholders should prioritise the development, accreditation and piloting of new, AMS focused PCDT and pharmacist prescribing pathways for a constrained set of first line Access antibiotics for clearly defined indications including UTIs and selected STIs (Supplementary Table S2)[56,79,119,122] • SAPC, universities, and professional bodies, should urgently convene a joint working group to specify curricula, competency requirements and supervision arrangements, drawing on WHO AMR competency frameworks, WHO AWaRe guidance, and national and international pharmacy workforce guidance to further develop the PCDT supplementary qualification[50,118,122] • Pilot implementation should be accompanied by rigorous evaluation of clinical outcomes, equity and unintended consequences, with a view to informing wider rollout if results are favourable. This will necessarily involve academic institutions in South Africa working with others
Strengthen pharmacist–prescriber partnerships and data-driven AMS	• Collaboration between pharmacists and prescribers has been shown to improve guideline concordance, increase the proportion of Access antibiotics used and reduce unnecessary antibiotic prescribing for URTIs in primary care settings in South Africa and elsewhere (Supplementary Table S4). • Scaling up such models would move AMS away from ad hoc, individual initiatives in hospitals, towards a more systematic team based practice in primary care where up to 90% or more of antibiotics are used in patients across LMICs, and where there are currently concerns with the use of antibiotics in South Africa (Supplementary Table S1)[30,32] • Priority actions include: (i) expanding pharmacist led audit and feedback sessions alongside academic detailing programmes targeting high volume antibiotic prescribers; (ii) formalising shared care pathways between public sector clinics and community pharmacies for common infections including UTIs and URTIs; and (iii) embedding AMS related indicators into routine performance management for both pharmacy and medical services (Supplementary Table S4) • These activities should be aligned with WHO and FIP recommendations that all healthcare professionals, including pharmacists, acquire core AMR and AMS competencies during pre-service and in-service training.[118,122] This includes enhanced communication skills acknowledging the issues of language where this occurs given ongoing concerns[82,114]
Align AMR workforce planning, access to care and stewardship objectives to achieve NAP goals	• The coexistence of rising AMR, persistently poor access to pharmaceutical care in many public and rural settings, and growing unemployment among community pharmacists and pharmacist's assistants in South Africa, highlights the absence of a current coherent AMR workforce strategy to address rising rates. [30,31,46] • International frameworks emphasise that developing an AMR competent workforce is a central pillar of effective national responses, with pharmacists increasingly recognised as key stewards of antimicrobial use • For South Africa, this implies moving beyond generic calls for "more pharmacists" towards a deliberate, competency based workforce planning that links expanded community pharmacy roles to defined AMR and AMS functions across the healthcare system, e.g. surveillance activities, prescribing, dispensing, patient education and inter professional leadership • The strategic investment in community pharmacy infrastructure and roles, tied to expanded and clearly regulated scopes of practice, AMS responsibilities and sustainable remuneration, could simultaneously improve access to high quality primary care services, reduce inappropriate antibiotic use and absorb part of the growing pool of unemployed pharmacy professionals • Workforce policy should explicitly incorporate WHO AMR competency frameworks and related FIP development goals, ensuring that pre-service curricula, PCDT and other supplementary qualifications, and continuing professional development, are aligned with the knowledge, skills and behaviours required for effective antimicrobial stewardship. Such an approach would also respond to the concerns raised in the open letter regarding the absence of a current national AMR strategy and advisory structure, by signalling that pharmacy workforce reform is part of a broader, system level response to AMR rather than a stand alone professional agenda.

NB: AMR = Antimicrobial Resistance; AWaRe = Access, Watch and Reserve;[49] FIP: International Pharmaceutical Federation; PCDT = Primary Care Drug Therapy; SAPC = South African Pharmacy Council; UN-GA = United Nations General Assembly; URTIs = Upper Respiratory Tract Infections; UTIs = Urinary Tract Infections

Overall, it is important that community pharmacists have appropriate communication skills when talking with patients, including being aware of possible language issues; otherwise, there can be miscommunication potentially adversely affecting antibiotic use.[77,82,113,114] Patient and public engagement is also seen as increasingly important to reduce high levels of requests for antibiotics among patients in LMICs, even for self-limiting infections.[21,115] Community pharmacists can also play a key role in this respect.[21,114] Educational programmes can appreciably improve community pharmacy knowledge regarding antibiotics, AMR and AMS, benefitting all key stakeholder groups going forward.[116]

Recommendations for South African pharmacy stakeholders

South Africa's expired AMR National Strategy Framework, and the recent open letter to the Minister of Health, underscore the urgency of restoring a coherent national response to AMR, including a functioning scientific advisory mechanism.[43,46,56,117,118] Against this backdrop, and in line with the WHO GAP and AWaRe targets, the evidence assembled in this editorial supports a deliberate move away from narrowly punitive, inspection led responses to address the selling of antibiotics without a prescription towards a more enabling, stewardship oriented vision for community pharmacy within a strengthened AMR workforce. This includes the potential for diagnosing and dispensing of antibiotics for agreed conditions to address barriers and shortfalls currently in primary care in South Africa.

Four interrelated sets of actions are proposed for the South African Pharmacy Council (SAPC), the National Department of Health, professional associations, universities and other partners (Table I).

Taken together, these recommendations suggest that South Africa's policy debate should pivot from a narrow focus on enforcing prescription only antibiotic rules towards a more nuanced, system oriented strategy that leverages the full potential of the pharmaceutical workforce within a revitalised national AMR framework.

Conclusion

Community pharmacists in South Africa already contribute meaningfully to AMS activities through conservative dispensing for self limiting infections such as URTIs with typically symptomatic care, and growing engagement in AMS initiatives. However, their potential remains under utilised within the current national AMR policy and service delivery frameworks.

International and local evidence demonstrates that, when appropriately trained, supported and regulated, community pharmacists can safely manage selected infections, reduce unnecessary antibiotic use, and partner effectively with prescribers and patients to optimise their care. At a time when South Africa faces an expired AMR National Strategy Framework, growing AMR rates and the consequences, alongside gaps in access to quality primary care, and increasing pharmacy unemployment, there is a compelling case for repositioning community pharmacists as core AMS partners within a revitalised national AMR response. This supported by an expanded Primary Care Drug Therapy and pharmacist prescribing pathways, structured AMS collaboration with prescribers, and a competency based workforce planning aligned with WHO and FIP guidance.

Ethical considerations

There are no ethical considerations as no patients were involved in this study.

Conflicts of interest

The authors have no relevant conflicts of interest to declare.

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From the next issue of the SAPJ, and in line with our new DHET accredited status (via SCOPUS), an article publication charge (APC) of R5 800 (excluding VAT) will be levied to support the costs of managing peer review, copyediting, design and layout, and open access hosting of accepted manuscripts; this APC will not apply to authors who are paid up PSSA members. This will apply to all papers that are accepted for publication from the 1st of January 2026.

As this year draws to a close, the SAPJ editorial team extends warm festive greetings to all our readers, authors, reviewers, and partners. May you enjoy a restful holiday period with family and colleagues, and return refreshed for a productive year ahead in 2026 as we continue to grow SAPJ's contribution to pharmacy in South Africa and beyond.

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S3

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Allopurinol 100 mg

S3

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INDICATIONS[1]

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It may be effective in patients with impaired renal function. ALLOPURINOL CIPLA is also used in the treatment of hyperuricaemia associated with leukaemia or resulting from radiotherapy or the use of antineoplastic agents such as mercaptopurine, or during treatment with diuretics of the thiazide or similar type.

S3 Reg. No. P/3.3/180, 181. Allopurinol 100 Cipla / Allopurinol 300 Cipla. Each tablet contains Allopurinol 100 mg / 300 mg. For full prescribing information, refer to the Professional Information approved by the medicines regulatory authority. References: 1. Professional Information approved by SAHPRA: Allopurinol 100 Cipla; Allopurinol 300 Cipla (Tablets). CIPLA MEDPRO (PTY) LTD. Co. Reg. No. 1995/004182/07. Building 9, Parc du Cap, Mispel Street, Bellville, 7530, RSA. Website: www.cipla.co.za. Customer Care: 080 222 6662 [1441517501a]

President's Message

One profession, many roles: Celebrating unity and purpose in South African pharmacy

Renier Coetzee
PSSA President

Each September, our profession unites to celebrate Pharmacy Month. This year's theme, *"Think Health, Think Pharmacy – One Profession, Many Roles"*, served as a reminder of the vital contribution pharmacists make to healthcare in South Africa.

The enthusiasm in the weeks leading up to Pharmacy Month was remarkable. Across hospitals, community pharmacies, universities, and industry settings, pharmacists and pharmacy students organised creative and meaningful initiatives. It was especially encouraging to witness young pharmacists and students stepping forward as leaders. Their passion, innovation, and dedication bring new energy and purpose to our profession. To every pharmacist, pharmacist's assistant, and pharmacy student who took part: your efforts have once again showcased the breadth and excellence of pharmacy practice in our country.

Among the most encouraging developments this year was the emergence of a spirit of unity. Though we work in diverse settings, academia, industry, hospitals, community practice, regulation, and research, we share a common mission: ensuring the safe and effective use of medicines while advancing the health of our communities. We are truly one profession with many roles, each equally valuable and mutually reinforcing. Together, we form the backbone of a healthcare system that strives to be accessible, dependable, and patient-centred.

Our recent Annual General Meeting and Conference reinforced this sense of collective purpose. The gathering brought together authentic voices of pharmacists serving real communities and addressing genuine challenges. We heard accounts of dedication, resilience, and meaningful impact. On Women's Day, we had the privilege of learning from extraordinary women leading change in their fields. Their perspectives and lived experiences underscored not only the strength and compassion within our ranks but also the critical importance of inclusivity and collaboration in shaping pharmacy's future. The atmosphere was electric, and the respectful engagement of all attendees reminded us that meaningful progress emerges from listening, learning, and working together.

As we reflect on the past year, we can take pride in what we have achieved as a profession, yet we are reminded that our work is far from done. The coming year invites us to build on this momentum with renewed purpose. Guided by the PSSA's mission to serve the needs and interests of pharmacists and to promote the profession for the benefit of society, 2026 presents an opportunity to deepen our collective impact. We will continue strengthening collaboration across sectors, advocating for a healthcare system that fully recognises the pharmacist's contribution to universal health coverage, and ensuring that our voice remains strong in shaping policies on public health, patient safety, and rational medicine use. Above all, let us commit to supporting one another, mentoring future leaders, and advancing the values of excellence, integrity, and unity that define our profession.

On a personal level, I look forward to continuing my studies in law, with a focus on health as a human right, a principle that lies at the heart of what we do as pharmacists. Access to healthcare, safe medicines, and equitable treatment are not privileges; they are rights. As we move into 2026, I challenge each of us to reflect: what will you focus on in 2026? How will you contribute to advancing our shared vision of a healthier South Africa through pharmacy?

As this year comes to a close, I wish to extend my deepest gratitude to every member of the pharmacy family for your dedication, compassion, and steadfast service to patients and communities. Though your work often occurs without fanfare or recognition, its impact resonates profoundly.

May the festive season offer you rest, reflection, and renewed energy for the year ahead. I wish you peace, good health, and joy during this holiday season.

Report of the FIP 2025 Congress, Copenhagen, Denmark 30 August – 4 September 2025

The 83rd World Congress of Pharmacy and Pharmaceutical Sciences (FIP Copenhagen 2025) was a landmark event that brought together over 3,300 delegates from more than 100 countries under the theme *"Think Health, Think Pharmacist"*. The Congress, held alongside the FIP Council Meeting (30–31 August 2025), reaffirmed pharmacy's vital role in global health transformation and set a unified agenda for advancing the profession through innovation, leadership, and collaboration.

The Opening Ceremony emphasised the profession's leadership in strengthening primary healthcare and responding to global health challenges. A defining moment was the signing of the Copenhagen Declaration on AMR by 75 organisations, including the PSSA, representing a unified commitment to tackling this global threat. Awards and recognitions celebrated excellence across pharmaceutical science, education, and practice, while the FIP Foundation highlighted initiatives that promote health literacy, digital transformation, and workforce innovation.

The FIP Digital Pharmacy Summit explored how technology is transforming pharmacy practice globally. Discussions focused on artificial intelligence (AI), telepharmacy, drones, wearables, and blockchain, showcasing how these tools can improve patient access, medicine safety, and data-driven care. Ethical use, transparency, and patient-centred integration remained key priorities. Sessions on health literacy emphasised communication as central to equitable healthcare. Tools such as pictograms, medication guides, and teach-back methods were presented as practical strategies to improve patient understanding and engagement. The Congress reinforced pharmacists' role as accessible health educators and advocates for patient autonomy.

Delegates learnt about the importance of innovation and entrepreneurship in pharmacy education and examined how institutions can align academic curricula with changing healthcare needs through interdisciplinary collaboration and digital integration. Workforce sessions highlighted resilience, diversity, and leadership, encouraging mentorship, portfolio careers, and ongoing professional development. These strategies aim to develop a workforce capable of managing change and providing high-quality, patient-centred care in dynamic healthcare settings.

Advances in hospital and community pharmacy practice were highlighted through updates to the Basel Statements, establishing global standards for optimal medicines use. Denmark's pharmacy model stood out for its digital prescriptions, robotic dispensing, and comprehensive patient support services, illustrating innovation in action. Sustainability was equally emphasised through presentations that demonstrated the profession's active contribution to climate action and responsible waste management, all while maintaining patient care quality.

South African Representation and Session Participation

South Africans once again made a strong mark at FIP 2025 through diverse and impactful contributions (list is not exhaustive):

- Dr Andy Gray and Prof Sabiha Essack – "Should Pharmacists Prescribe Antibiotics? The Global Respiratory Infection Partnership (GRIP)"
- Stephanus Hendriksz – "Pharmacist Storytelling: Real-world Impact of Digital Health"
- Refiloe Mogale (PSSA) – "Pharmacist-Initiated Care and Prescribing (PCDT) in South Africa"
- Dr Sham Moodley – Session Chair: "Shaping Global Self-Care Policies: A Dialogue with Leaders on the Future of Self-Care"
- Dr Andy Gray – Session Chair: "Children Are Not Just Small Adults! Tailoring Science and Pharmaceutical Care to Our Youngest Patients"
- Dr Prinesh Reddy – "Navigating the Future: AI Frameworks in Healthcare Practice"
- Tammy Gopal – "Regulatory Harmonisation: Successes and Challenges Along the Pathway to Regulatory Convergence"
- Precious Ncayiyana – "Healing Heroes: Military Pharmacists in Action"

These engagements showcased South Africa's leadership in digital health, policy development, antimicrobial stewardship, and self-care innovation.

Beyond presentations, South Africa's delegation demonstrated exceptional unity and visibility throughout the Congress. The team engaged in a series of strategic networking meetings, building strong international partnerships and raising the country's professional profile. Highlights included meetings with the FIP President, Mr Paul Sinclair, and FIP CEO, Dr Catherine Duggan, as well as productive engagements with the Commonwealth Pharmacists Association (CPA) leadership. The South African team also connected with representatives from Canada, Scotland, Germany, Ireland, Norway, PGEU (Europe), Australia, Switzerland, the Netherlands, the United Kingdom, and the United States. These

interactions provided valuable opportunities to share insights, exchange best practices, and explore potential collaborations in workforce development, professional regulation, and public health advocacy. The strong sense of unity and collaboration displayed by the South African delegation reinforced the country's position as a committed and respected member of the global pharmacy community.

SA delegation

Meeting the Commonwealth Pharmacists Association

PSSA collaborating with other FIP member organisations

The FIP Council Meeting convened 85 Member Organisations, four Observer Organisations, four Allied Organisations, eight FIP Sections, and five forums, making key decisions to shape the Federation's governance and strategic direction. In his annual report, FIP President Paul Sinclair highlighted key achievements, including FIP's active engagement at the World Health Assembly (WHA) in Geneva, where the delegation participated in over 66 side events. The Council adopted the new FIP Strategic Plan 2025–2030, outlining six strategic outcomes: access to medicines and health services; patient-centred pharmaceutical care; innovation and pharmaceutical sciences; strengthening pharmaceutical workforce development; AMR and a united for health approach; leadership, governance, and global engagement. The adoption of this plan established an ambitious vision for the next five years, ensuring the profession remains adaptable, equitable, and future-ready. Four new FIP Policy Statements were adopted:

- Artificial Intelligence in Pharmacy Practice (PSSA participated)
- Pharmacists: Gateway to Self-care
- People-centred Pharmaceutical Care
- The Role of Pharmacists in Non-communicable Diseases (NCDs) (PSSA participated)

The FIP Copenhagen 2025 Congress demonstrated the pharmacy profession's collective drive to advance health through innovation, advocacy, and collaboration. South Africa's strong participation, thought leadership, and cohesive presence not only elevated its profile on the global stage but also reflected the strength and unity of the country's pharmacy community. As the global profession looks ahead to FIP Montreal 2026, the foundation laid in Copenhagen will continue to inspire collaboration, growth, and a shared commitment to improving health for all.

Catherine Duggan (FIP CEO), Refiloe Mogale (PSSA Exec Director) and Paul Sinclair (FIP President)

Closing dinner - SA delegation

The PSSA/Alpha Pharm distance learning programme 2025

The PSSA/Alpha Pharm distance learning programme continues to offer pharmacists useful, practical, up-to-date information that enables them to provide optimal pharmaceutical care to their patients.

Module 5, 2025 – Bipolar disorder

Sadness and joy are part of everyday life. Sadness is a natural response to loss or disappointment, and joy or elation is a natural response to success or achievements. Mood fluctuations, therefore, are normal responses to daily life because of either pleasant or unpleasant events.

However, severe and persistent mood swings that result in psychological distress and behavioural impairment may be symptoms of an underlying mood disorder. A mood disorder may be present when sadness or elation:

- Are overly intense and persistent
- Are accompanied by other symptoms that meet the criteria for a mood disorder
- Significantly impair the person's capacity to function physically, socially and at work

In such cases, intense sadness is termed depression, and intense elation is termed mania.

The term bipolar disorder is based on the shift in moods between these two extremes, or poles, of mood disorders – depression and mania. The main characteristic separating bipolar disorders from other mood disorders is the presence of recurring mania or hypomania (a less severe form of mania) that may alternate with depressive episodes.

This module describes the clinical features and treatment of bipolar disorder, complemented by information on lifestyle modifications and psychosocial interventions.

For more information about this programme, contact Gill or Glynis at Insight Medicine Information on 011 706 6939 or email: cpdalphapharm@insightmed.co.za.

The PSSA/Alpha Pharm clinical education programme 2025 for pharmacy staff

The PSSA/Alpha Pharm pharmacy staff clinical education programme continues to offer front-shop assistants or pharmacists' assistants up-to-date information that enables them to provide optimal pharmaceutical care to their patients. All pharmacy staff need to be familiar with the use of unscheduled medicines and should be reminded of when it is necessary to refer the patient to the pharmacist.

Module 5, 2025 – Depression

Despite being one of the most common mental disorders worldwide, depression often goes unnoticed. Many people are reluctant to speak about their symptoms due to stigma, and some may perceive their condition as personal failure, rather than a real illness.

Depression does not just affect the person living with it, but may also impact their family, friends, and colleagues.

Depression is not the same as a temporary low mood. It is not a sign of personal weakness or a condition that can be willed or wished away. People with depression cannot merely "pull themselves together" and get better. Depression is treatable, and most people respond positively to treatment, which can include counselling, medication, and other supportive measures.

It is important to refer people with symptoms of possible depression to a doctor for appropriate assessment, accurate diagnosis and treatment. Once identified, it is important to offer support to those suffering from depression and to encourage them to persist with their treatment. By increasing awareness, you, as the Front Shop staff member, can play an important role in supporting mental health within the community. This module will help you to do just that.

If you would like to participate in the PSSA/Alpha Pharm pharmacy staff clinical education programme, please contact Gill or Glynis for further information on 011 706 6939 or email: cpdalphapharm@insightmed.co.za.

PSSA/Insight CE Programme for Pharmacists

Your CPD for 2026 - Stay informed. Stay inspired. Stay ahead.

Insight Medicine Information, in partnership with the Pharmaceutical Society of South Africa (PSSA), is proud to continue offering our highly regarded CPD Programme in 2026 — designed to keep you, the pharmacist, at the cutting edge of pharmacy practice.

This programme provides an effortless way to meet the South African Pharmacy Council's CPD requirements while keeping your knowledge current and clinically relevant.

The programme includes five convenient online study modules, released every two months on www.insightcpd.co.za. Each module features practical, evidence-based content to support confident, high-quality patient care, together with a multiple-choice assessment. Completing four out of five modules successfully will earn you a PSSA/Insight CPD Certificate at year-end.

Based on participant feedback, the proposed 2026 topics include:

- Hypertension – latest treatment guidelines
- Weight Loss – new medicines and management strategies
- ADHD – effective treatments to improve symptoms and functioning
- Osteoporosis – prevention and treatment updates
- Childhood Vaccinations – current recommendations, including catch-up schedules

These modules are crafted around the key learning areas that matter most to you and your daily practice.

Enrol today at www.insightcpd.co.za

Remember to register your staff for the **Pharmacy Staff Clinical Education Programme**, which runs in parallel with the Continuing Education (CE) Programme for pharmacists.

For registration queries or further information regarding the Continuing Education Programme for pharmacists or the Clinical Education Programme for Pharmacy Staff, please contact Glynis on tel. (011) 706 6939 or email: cpd@insightmed.co.za or see the website above.

Beyond the counter: Pharmacy month through the eyes of the future

Thinavhuyo Musekene

Pharmacy Month has always been about highlighting the vital role of pharmacists in healthcare. But this year something different stood out: the voice of the future. Young pharmacists across South Africa did not just take part – they reshaped the way Pharmacy Month was celebrated.

Stepping beyond the counter

For decades, the image of a pharmacist has been closely tied to the dispensary. While that remains central, today's young professionals are showing that pharmacy goes far beyond teaching and learning about medication, production and supply of medication, counting tablets and filling prescriptions. During this year's Pharmacy Month, the youth was actively involved in public health campaigns, school outreach programmes, digital storytelling, and wellness initiatives that connected with communities in fresh and unexpected ways.

It was about redefining the narrative: pharmacists are not just behind the counter, but also in classrooms, clinics, social spaces, and online platforms – meeting patients where they are.

The fresh energy of anew generation

The hallmark of this year's celebrations was creativity. From using social media reels to demystify complex medicines, to creating pop-up health stations in communities, young pharmacists embraced new ways of delivering old messages. The goal was clear: to make health information accessible, relatable, and memorable.

This fresh energy did not replace tradition – it built on it. By drawing from the mentorship of senior colleagues and blending it with youthful innovation, young pharmacists have demonstrated how intergenerational collaboration strengthens pharmacy's presence.

What the future sees

Through the eyes of young pharmacists, the future of the profession is bold and adaptive. It is one where pharmacists:

- Lead in preventative health through vaccination, screening, and education,
- Harness technology and digital platforms to expand patient reach,
- Champion collaboration with other healthcare professionals, and
- Continue to be trusted, approachable figures in communities.

The message is simple: the future of pharmacy is bigger than behind the counter – it is everywhere, where health is needed.

Closing with gratitude

The PSSA YPG extends sincere thanks to all pharmacy managers, healthcare stakeholders, mentors, and institutions who opened doors for young pharmacists to contribute meaningfully during Pharmacy Month. Most importantly, we thank our communities for allowing us to walk with them on their health journeys.

Pharmacy Month 2025 reminded us that pharmacy is not just about where we stand, but how far we reach. And the future, seen through the eyes of young pharmacists, is limitless.

Feel free to reach out to us at | Email: ypg@pssa.org.za | Facebook: Young Pharmacists' Group of PSSA | Instagram: @pssaypg
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Young pharmacists – connected, engaged, empowered and inspired!

Empowering patients at the healthcare worker-patient interface, using a medication counselling modality

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Pharmacist, Dr Pixley Ka Isaka Seme Memorial Hospital

Based on the project which was awarded the Professional Innovation Project 2025 grant by the Pharmaceutical Society of South Africa, Young Pharmacists' Group (PSSA YPG)

A patient walks into a busy public clinic to collect her medicine. She is anxious, clutching a slip of paper, and unsure about how to take the treatment. Minutes later, she walks out; not just with her medicine, but with a clear understanding of why she needs it, how to take it, what to expect, and when to return if something feels wrong. She leaves confident, in control, and empowered.

That transformation happened in under five minutes, through a single, structured conversation with a pharmacist. Now imagine if every patient in South Africa, whether in a rural clinic or a tertiary hospital, had that same experience. This is the vision driving our work, and it's what inspired the Standardised Counselling Tool Protocol.

Personal introduction

As a public sector pharmacist in KwaZulu-Natal (KZN) with a passion for improving the way we serve patients through high quality, patient-centred care. My professional background spans quality improvement, mentorship, and advocacy within the South African Association of Hospital and Institutional Pharmacists (SAAHIP) and the

Pharmaceutical Society of South Africa (PSSA). My daily work continues to show me the meaningful impact a pharmacist can have in shaping a patient's health journey and how much potential we have to make that experience consistently empowering and meaningful.

For me, pharmacy is not just about dispensing medicines; it's about ensuring patients understand their treatment, feel confident to take it correctly, and know what to expect from it. It is about the conversation that transforms a packet of tablets into a tool for recovery, and the trust built when patients feel genuinely heard and informed.

Origin story – Discovering the counselling protocol concept

In 2022, I attended a SAAHIP meeting where Sameshin Reddy introduced the concept of a standardised medication counselling tool - a powerful idea that I resonated with immediately. I recognised in it a solution to a long-standing challenge I had observed in both primary healthcare clinics and larger regional hospitals: the variability in the quality and completeness of medication counselling provided to patients.

Sometimes, patients walked away confident and informed; other times, they left uncertain about how or why to take their medicines. The differences often came down to time constraints, staff turnover, or varying levels of training and communication skills among healthcare workers. I imagined what it would mean if every patient, regardless of where they received their care, could have the same high quality, comprehensive counselling experience, one that met professional standards and truly empowered them to take charge of their health.

That vision stayed with me and when the opportunity arose to put it into action, I knew we had to try.

Motivation and vision – Patient-centred care and medicine literacy

Medicine literacy is more than knowing the name of a drug; it's about patients understanding what the medicine is for, how to take it, what to expect, and when to seek help. It is about equipping them with the knowledge and confidence to be active participants in their own health.

In South Africa's public healthcare system, with its high patient volumes and resource constraints, we cannot allow this critical element of care to be overlooked. Poor adherence contributes to treatment failures, avoidable complications, and wasted resources, but more importantly, it takes away from patients the power to protect and improve their own health.

My vision is to see patient-centred care embedded in every interaction, where a patient collecting medicines at a community health centre receives the same quality of counselling as one attending a higher level of care. This is about equity, dignity, and safety. It's also about sustainability: when patients understand their treatment and adhere to it, we use our healthcare resources more efficiently, reduce avoidable admissions, and protect the effectiveness of medicines.

Project journey

The project I now have the privilege to collaboratively work on is a SAAHIP KZN Coastal Branch Focus Area Project under the theme of Improved Quality and Safety of Healthcare Services. This aligns not only with Pillar 5 of the Presidential Health Compact but also with National Core Standards, the Patient

Experience of Care and the Ideal Hospital Realisation and Maintenance Regulatory requirements.

The concept is to develop and implement a standardised counselling protocol that prompts healthcare workers (HCWs) to cover all essential points during medicine counselling. It's based on regulatory requirements, clinical guidelines, and communication best practice, but designed to be practical in busy, real-world settings.

This intervention forms part of a broader strategy we are exploring in the creation of different solutions to enhance the patient experience of care. We envisage the counselling protocol to be strategically positioned at pharmacy outpatient counselling areas. This will serve as a clinical counselling guideline for HCWs involved in the medication counselling process, at the patient interface. Through a continuous process of user feedback and data analysis, this project seeks to then further refine and then integrate a fit for purpose solution into the routine pharmacy outpatient dispensing workflow.

We have secured authorisation to carry out this project from the Head of Pharmaceutical Services in KwaZulu-Natal, and we are fortunate to have members from SAAHIP branches outside KZN co-opted into this focus area project. This collaboration strengthens the potential for impact and sustainability.

Gratitude and opportunity

This year, the YPG PSSA Professional Innovation Project recognised the potential of this idea and awarded it first place, along with an implementation grant. We are deeply grateful for this support, not only because it provides resources, but because it validates the importance of this work.

I first heard about this project idea back in 2022 and now, thanks to the PSSA YPG, we have the chance to turn an innovative concept into professional practice. The grant allows us to take steps that wouldn't have been possible without this support.

Winning the grant is also a powerful reminder of the value of collaboration within our profession. It shows that when we share ideas and support each other, we can create solutions that improve care for patients and strengthen our role as healthcare leaders.

Future impact – a shared vision

Imagine a healthcare system where a patient in a rural clinic and a patient in a large city hospital, both receiving their medicines from different healthcare workers but both leaving with the same clear, complete understanding of their treatment. They know how to take it, why it matters, what to watch for, and when to come back. They feel confident, respected, and involved in their own care.

That is the vision. A healthcare system where geography, facility type, or staff changes do not affect the quality of patient counselling. Where every medicine is paired with the requisite knowledge that makes it effective. This protocol will help ensure consistent, high-quality counselling becomes standard practice, not something delivered only in preparation for a Patient Experience of Care Audit.

In the long term, I believe this project can be scaled to all facilities, embedded in quality improvement frameworks, and contribute to national efforts to strengthen healthcare services. I hope it inspires more pharmacists to take the lead in developing patient-centred solutions because our profession is uniquely positioned to bridge the gap between medicine supply and optimum medicine effectiveness.

Closing thoughts

This journey is about more than a counselling protocol. It is about reimagining the patient experience, using evidence-based tools to create consistent quality in every encounter. It's about giving patients not just the medicine they need, but the knowledge and confidence to use it well.

I am proud to be part of a profession that can make this vision a reality, and I am committed to working with colleagues across sectors to see it through. My hope is that years from now, we'll look back and see this project as one small but important step towards a more equitable, effective, and sustainable healthcare system.

To the PSSA YPG - thank you for believing in this idea, for investing in its potential, and for giving us the means to turn it into action. Together, we are proving that innovation in pharmacy can start with a conversation and end with healthier, more empowered patients.

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A 2023 study reshaped our understanding of respiratory infections by highlighting how nasal temperature influences susceptibility. Silverlab's specialised ionic (Ag^+) Colloidal Silver Nasal Spray, designed for the intranasal environment, can be used safely on a daily basis to reduce the risk of illness throughout the year while supporting sinus health.

Throat

The throat is another common site for airway infections. With its broad-spectrum antiviral and antibacterial properties and excellent safety profile, Silverlab's ionic (Ag^+) Colloidal Silver Healing Spray is the ideal throat spray for individuals of all ages.

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More info

Antibiotics and probiotics: How antibiotics affect the gut microbiome and the role of probiotics in its recovery

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Abstract

The human gut microbiome plays a vital role in maintaining health. Disruption of this ecosystem, or dysbiosis, is linked not only to gastrointestinal disorders such as inflammatory bowel disease, but also to systemic conditions including obesity, type 2 diabetes, atopy, and neurodegenerative diseases. Antibiotics are a major contributor to dysbiosis, depleting beneficial bacteria, reducing microbial diversity, and promoting the proliferation of opportunistic and antimicrobial-resistant pathogens. Probiotics have demonstrated efficacy in reducing antibiotic-associated diarrhoea. Probitec®, containing 15 billion CFUs of *Lactobacillus acidophilus* La-14, offers targeted support for restoring microbial balance and addressing antibiotic-associated dysbiosis.

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Introduction

The human intestinal tract harbours a diverse and complex microbial community, the gut microbiome, which plays a central role in health and disease.[1,2] It has been estimated that the adult colon contains over 40 trillion bacterial cells from about 1 000 different bacterial species.[1,3] At the level of species and strains, the microbial diversity between individuals is remarkable and each individual harbours a distinctive microbial composition in the gut.[3]

Disruption of the gut microbiome or *dysbiosis* can have major consequences for health and has been associated with gastrointestinal conditions such as inflammatory bowel disease and irritable bowel syndrome, as well as wider systemic manifestations of disease, such as obesity, type 2 diabetes and atopy.[2] Emerging evidence links dysbiosis with neurodegenerative diseases, underscoring the relevance of the microbiota-gut-brain axis.[4] Dysbiosis, therefore, correlates not only with gastrointestinal disorders but also with other systemic pathologies.[4]

Insights into dysbiosis

Dysbiosis, defined by the loss of beneficial microbes, the overgrowth of pathogens, and reduced microbial diversity, may be the result of environmental stressors (including diet), immune dysregulation, metabolic changes, as well as antibiotic use.[4]

A stable gut ecosystem is sustained by dominant phyla such as Firmicutes and Bacteroidetes, which modulate immune function, produce short-chain fatty acids (SCFAs), and maintain mucosal integrity.[4] Although the intestinal tract is colonised by a varied community of commensal microorganisms, many gut microbial species have the potential to cause disease.[5] Species from the *Enterobacteriaceae* family such as *Escherichia coli (E. coli),* are opportunistic pathogens with the potential to cause severe infections.[5]

Dysbiosis associated with antibiotic use can destabilise gut homeostasis and favour the expansion of opportunistic pathogens like *Enterobacteriaceae*.[4]

Although antibiotics are essential for treating many bacterial infections, they can dramatically disrupt the gut microbiome.[4] Broad-spectrum agents such as aminopenicillins with/without clavulanate, cephalosporins, clindamycin and the fluoroquinolones often drive dysbiosis, resulting in loss of microbial diversity by depleting beneficial genera.[4] Weakened colonisation of beneficial genera paves the way for opportunistic pathogens.[4]

The effects of antibiotics on gut microbiota composition and diversity can last from weeks to months.[6] Short-term effects include antibiotic-associated diarrhoea, *Clostridiodes difficile*-associated diarrhoea and *Helicobacter pylori* infections.[6] Long-term effects have been linked to obesity, type 2 diabetes and inflammatory bowel disease.[3]

Use of antibiotics can also accelerate antibiotic resistance.[4] Antibiotic-induced dysbiosis accelerates the transfer of antimicrobial resistance genes within the gut microbiome, enabling the proliferation of multidrug-resistant organisms, including extended-spectrum β-lactamase (ESBL)-producing *Enterobacteriaceae*.[4]

Recovery from these changes in the gut microbiome depends on antibiotic spectrum, dose, and duration of use, potentially taking months or even years in some cases.[4] Emerging interventions like faecal microbiota transplantation and probiotics may counter these changes while preserving the integrity of the broader microbial ecosystem.[4]

Probiotics and prebiotics – the concepts

Probiotics are live microorganisms that, when administered in adequate amounts, confer a health benefit on the host.[3] The term 'probiotic' should be reserved for live microbes that

Table I: Nomenclature used for some probiotics

Genus	Species	Subspecies	Strain designation	International strain depository designation	Common name
Lacticaseibacillus Former name: *Lactobacillus casei*	*rhamnosus*	None	GG	ATCC 53103	LGG
Bifidobacterium	*animalis*	*lactis*	DN-173 010	CN-CM I-2494	*Bifidus regularis*
Bifidobacterium	*longum*	*longum*	35624	NCIMB 41003	*Bifantis*
Lactobacillus	*acidophilus*	None	La-14	ATTCSD5212	*Acidophilus*

have been shown in clinical studies to impart a health benefit.[3] Many lactobacilli, *Saccharomyces boulardii* and some species of *Bifidobacterium* have historically been used as probiotics.[3] Some strains of *E.coli* and *Alkalihalobacillus clausii* (formerly known as *Bacillus clausii)* are also used as probiotics.[3,6]

Prebiotics are selectively fermented components that result in specific changes in the composition and/or activity of the gastrointestinal microbiota, thereby conferring benefits for the host's health.[3] The key aspects of a prebiotic are that it is nondigestible by the host and that it leads to health benefits through a positive influence on the resident beneficial microbes.[3] Prebiotics affect intestinal bacteria by enhancing the numbers or activities of beneficial bacteria.[3] Most prebiotics are food ingredients and include oligofructose (fructooligosaccharide, FOS), inulin, galactooligosaccharides (GOS) and lactulose.[3]

Synbiotics are mixtures comprising live microorganisms and substrate(s) selectively used by the host microorganisms that confer a health benefit on the host.[3] There are two types of synbiotic: complementary (mixtures of probiotics and prebiotics) and synergistic (mixtures of live microbes selected to use a co-administered substrate for a health effect.[3]

Genera, species and strains used as probiotics

A probiotic strain is identified by the genus, species, subspecies (if applicable) and an alphanumeric designation that identifies a specific strain.[3] In the scientific community, there is an agreed nomenclature for genus, species and subspecies names.[3] However, commercial strain names, product names and trade names are not controlled by the scientific community and strains names may vary. Table I shows a few examples of commercial strains and the names associated with them.[3]

Strain designations are important because the most robust approach to probiotic evidence is to link benefits to specific strains or strain combinations of probiotics at the effective dose.[3] Some strains have novel properties that account for certain neurological, immunological, and antimicrobial activities while some mechanisms of probiotic activity are likely shared among different strains, species, or even genera.[3]

The dose needed for probiotics varies depending on the strain and the indication.[3] Although many over-the-counter probiotics deliver in the range of 1–10 billion colony-forming units (CFUs) per dose, it is not possible to state a general dose needed for probiotics.[3] The dosage should be based on human studies showing a health benefit for a particular probiotic for a particular indication.[3]

Probiotics and antibiotic-associated diarrhoea

Probiotics have been shown to alleviate gut dysbiosis caused by antibiotic treatment and to confer protection against antibiotic-associated diarrhoea.[6]

- Several studies have shown that consumption of probiotics such as *Lactobacillus acidophilus, Lacticaseibacillus casei, Lacticaseibacillus rhamnosus, Saccharomyces boulardii* and *Bifidobacterium* reduce the risk of antibiotic-associated diarrhoea.[6]
- Meta-analyses have concluded that probiotics provide a moderate effect in preventing antibiotic-associated diarrhoea in children, adults and in the elderly, with larger doses (e.g. 5 billion CFUs per day) being preferred.[3,6]

Probiotic safety

Traditional lactic acid bacteria, long associated with food fermentation, are generally considered safe for oral consumption for the generally otherwise healthy population and at levels traditionally used.[3] However, use in people with compromised immune function or serious underlying disease should be restricted to the strains and indications with proven safety and efficacy for these patients.[3]

A word on Probitec®

- Contains 15 billion CFUs of *Lactobacillus acidophilus La 14* per capsule.[7]
- May be used to normalise microbial balance in the gut, improve gut function, dysbiosis, and antibiotic-associated dysbiosis.[8]
- Contains fructooligosaccharides as the prebiotic to support the resident beneficial microbes in the gut.[3,7]
- Formulated using DUOCAP™ technology which allows the outer capsule to dissolve in the stomach releasing the prebiotic (fructooligosaccharides) while protecting the inner capsule until it reaches the small intestine (pH~6.5) where it releases the probiotic.[8,9]
- Can be taken with/without food and at the same time as the antibiotic.[7,10]
- Maintains 100% of its dose over two years, providing an acceptable CFU count for clinical efficacy.[8]

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Calming the acid: Pharmacotherapeutic approaches to gastro-oesophageal reflux disorder

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Abstract

Gastro-oesophageal reflux disease (GORD) is a chronic disorder where gastric contents, inclusive of gastric acid, pepsin and foodstuff, enter the oesophagus which leads to irritation and potential erosion. While refluxate regurgitation is a physiological process, pathophysiological levels of reflux may manifest as heartburn, regurgitation, and non-cardiac chest pain. Management should be approached from a non-pharmacotherapeutic vantage, where pharmacotherapy is included where justified to support treatment outcomes. In this review, the broad medication classes used for GORD treatment in South Africa are discussed, including the first-line proton pump inhibitors, histamine-2-receptor antagonists, antacids, and alginate-based treatments.

Keywords: antacid; alginate; gastro-oesophageal reflux disease; H2-receptor antagonist; proton pump inhibitor

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Introduction

Refluxate regurgitation, where gastric content moves into the oesophagus and oral cavity, is a natural physiological process that occurs throughout the day, however, does not necessarily incur pathological implications.[1] However, when frequency increases or removal from the oesophagus is not adequate, gastro-oesophageal reflux disease (GORD) may occur.[1-4] GORD is generally classified as either erosive oesophagitis or non-erosive oesophagitis, or may include premalignant Barrett's oesophagus.[1,5,6] Erosion is thus not necessarily present in all cases, which leaves non-erosive oesophagitis as the more commonly found presentation.[1-4,6] Symptomatically, GORD may present as per Table I.

Table I: Symptoms of gastro-oesophageal reflux disease[1-7]

Typical symptoms
Burning sensation in the chest and oral cavity
Refluxate regurgitation
Non-cardiac chest pain and discomfort
Extraoesophageal symptoms
Ear, nose and throat symptoms, such as asthma, sore throat, wheezing, pharyngitis, and sinusitis
Tooth erosion
Alarm symptoms
Dysphagia and odynophagia
Vomiting, including potential haematemesis
Unexplained weight loss
Iron-deficiency anaemia

A global prevalence systematic review by Nirwan et al. highlighted an overall GORD burden of 13.98%.[8] From the limited data available from Africa (n = 2) in their study, no prevalence could be determined, though other regions ranged from 12.88% (Latin America and The Caribbean) to 19.55% (North America).[8] Li et al. reported in their systematic review an incidence of 4 524.95 per 100 000 population in sub-Saharan Africa.[9] As such, GORD levels remain notable across the globe. GORD, as a chronic lifestyle disorder, is increasing and has significant impact on the quality of life of individuals. As such a common disorder, pharmacotherapeutic approaches have been well described and are, in general, not a cost-intensive management. However, it does not undermine the importance of non-pharmacotherapeutic approaches that should underpin health considerations.

Pathophysiology

GORD is a multifactorial disease, and thus various factors may contribute to its pathological development. Most commonly, loss of the anti-reflux barrier results in GORD, where the combined structural properties of the lower oesophageal sphincter, diaphragmatic crural sling, phreno-oesophageal ligament, angle of His, and intra-abdominal oesophageal length cannot prevent regurgitation.[6,10] As such, sphincter relaxation due to transient postprandial relaxation or due to lower oesophageal sphincter dysfunction promotes regurgitation of refluxate into the oesophagus.[1,2,4,6,11] Meal-induced lower oesophageal sphincter relaxation invariably contributes to a high acid burden within the oesophagus.[2,4] Increased abdominal pressure, hiatal hernias and delayed gastric emptying further contributes to reflux, as well as a supine position, thus potentiating the release of contents into the oesophagus.[2,4,11]

The refluxate contains a variety of potential irritants and eroding factors, such as gastric acid, pepsin, bile and biliary acids, pancreatic enzymes, and duodenal contents which may result in acidic or enzymatic oesophageal erosion and irritation.[12,13] The acid

pocket that forms post-meals is a challenge in GORD, particularly when coupled to reflux barrier dysfunction.[13] Furthermore, should the oesophagus not adequately clear contents, it contributes to localised damage.[2,4,6] Oesophageal mucosal health further determines the susceptibility of the lining to such damage.[2]

Risk factors

Various factors, ranging from the person and the environment, may predispose one to GORD, though it's important to acknowledge the multifactorial nature of the disease[2] which includes modifiable and non-modifiable factors.[1,5] Non-modifiable factors include advanced age, sex, genetics and anatomical concerns (e.g. hiatus hernias).[1,2,6] Increased body weight and adiposity, diet (including caffeinated drinks, alcohol, aerated drinks, acidic foods such as citrus and tomatoes, and chocolates), smoking and certain medication (such as certain nonsteroidal anti-inflammatory drugs, anticholinergics and antibiotics) are modifiable risk factors that increase the risk to develop GORD.[1,2,4,6]

Non-pharmacotherapeutic approaches

Lifestyle modifications are considered an important first step in resolving GORD, however, some contention is noted of their efficacy, given limited trial data.[2,4,10] Given the multifactorial nature of GORD, lifestyle changes are a cost-effective strategy to mitigate some of the underlying risk factors.[4] Alteration to diet and eating patterns allows for lower production of acid or disruption of the stomach contents, thus also reducing the potential for regurgitation or the acidity of refluxate.[2,4] These changes may include eating smaller, but more frequent meals; not eating within two hours of sleeping; and eliminating or reducing intake of GORD-sensitising foods and drinks, such as caffeinated or aerated drinks and acidic foods.[2,4] Postural alterations after eating, such as not reclining after meals or elevating the head while sleeping reduce potential refluxate regurgitation.[2,4] Smoking cessation and decreasing body weight if obese may also reduce the prevalence of GORD.[2,4] Under certain circumstances, such as the continued worsening or GORD, inefficacy of pharmacotherapy, high adverse effects burden or additional comorbidities or complexities may justify a surgical treatment, such as surgical fundoplications.[1,3,4,14]

Pharmacotherapeutic approaches

Pharmacotherapeutic management to GORD aims to reduce refluxate regurgitation and the acidity of the gastric contents, which in turn reduces the presence of irritants in the oesophagus and the severity of damage they may cause. Symptomatic severity and associated factors help designate the most appropriate treatment. Importantly, given potential overuse of pharmacotherapy, rationale clinical decision-making is needed to ensure that lifestyle changes underpin supportive pharmacotherapeutic use as needed.[15]

Proton pump inhibitor

Proton pump inhibitors (PPIs) are considered the primary pharmacotherapeutic option for GORD as they reduce the acidity of the gastric contents, thus mitigating their erosive and irritant properties.[10,15] PPIs are prodrugs which require bioactivation via protonation in the gastric parietal cell secretory canaliculi.[6] PPIs bind covalently and irreversibly to the gastric proton pump (H^+-K^+-ATPase), thus potently reducing acid secretion over an extended period of time, regardless of their short biological half-life.[6,15] Given the regeneration of proton pumps, continuous administration is needed to maintain efficacy during the active stages of the disease administration.[6] Given the need for an acidic environment, it rationalises their administration between 30 to 60 minutes prior to meals to ensure sufficient gastric acid production occurs.[6] Furthermore, as *de novo* synthesis of proton pumps occurs to a greater degree with overnight fasting, it supports recommendations for morning administration.[6]

A list of commonly prescribed PPIs is provided in Table II. PPIs should be prescribed at the lowest recommended dose and duration, with regular review to avoid overuse.[16] Given its potential for overuse or irrational prescription, use should also be considered cautiously or avoided in cases where isolated throat symptoms, undifferentiated or isolated gastrointestinal symptoms that are unlikely to be associated with GORD.[15,17,18] For less complex or severe cases of GORD, short-term therapy of four to eight weeks is considered, while longer treatments are considered with higher severity (such as erosive oesophagitis at a Los Angeles classification of Grade C and D).[15,17] Refractory GORD is defined when non-responsive or partial response to PPIs

Table II: Proton pump inhibitors available in South Africa (as obtained from mobiMIMS[19])

Proton pump inhibitor	Examples	Formulations	Available dose
Omeprazole	Lokit, Losec, Omez, Omiflux, Probitor, Rapacid, Sandoz Omeprazole	Capsules	10 mg, 20 mg, 40 mg
Lansoprazole	Adco-Roznal, Burnloc, Conoran, Lancap, Lasoloc, Lansoprazole Unicorn, Roznal OTC	Capsules	15 mg, 20, mg 30 mg, 40 mg
Dexlansoprazole	Dexilant	Capsules	30 mg, 60 mg
Esemoprazole	Esomeprazole Cipla, Fluxtrin, Fluxtrin OTC, Nexiam, Nexipraz, Nexomep, Truloc, Trusfluks	Tablets	20 mg, 40 mg
Pantroprazole	Pantocid, Pantoloc, Pantor, Pentoz, Peploc, Peploc OTC, Prazoloc, Prazoloc OTC, Praztek, Topzole	Tablets	20 mg, 40 mg
Rabeprazole	Rabemed, Ulcopraz	Tablets	10 mg, 20 mg

is observed after eight weeks of treatment,[7] which may justify approaching alternative management formats, such as surgery subject to diagnosis.[3,4,14]

Due to the potential for rebound acid hypersecretion, weaning off is recommended during deprescribing to avoid unnecessary complications.[6,17] Patients should be advised that an initial resurgence of symptoms may not suggest GORD itself, but rather a transient acid hypersecretion that should resolve.[15] To support deprescribing, PPI dose tapering can be done or transitioned to as-needed, or alternative treatment can be used, such as H2-receptor antagonists or alginates.[15,17] However, contention remains about how much or whether such replacements may reduce deprescribing-related effects, such as reoccurrence of GORD.[18]

Although PPIs are generally tolerated well in the short term, some adverse effects may occur, including abdominal pain, diarrhoea, dizziness, headaches and nausea.[6,15,17] Less common side-effects may include mineral imbalances (such as hypomagnesaemia, hypokalaemia and hypocalcaemia), potential for enteric bacterial infections (e.g. *Clostridium difficile*), rebound acid hypersecretion, nutrient malabsorption, and bone density concerns,[6,15,17] though many of these are considered with chronic use or have associated confounding factors complicating their causality.[6,10,15,17] Some concerns have also been raised regarding potential cardiovascular and gastric cancer associations with chronic use.[6]

H2-receptor antagonists

Histamine (H)-2 receptor antagonists can be considered as an alternative or adjunct to PPIs when symptoms are mild or intermittent.[16,20] H2-receptor antagonists selectively and reversibly inhibit H2 receptors on gastric parietal cells, thus reducing the secretion of gastric acid into the gastric lumen.[21,20] In South Africa, cimetidine is the H2-receptor antagonist of choice following the removal of ranitidine due to concerns of carcinogenic contaminants.[22,23] Cimetidine is available as tablets (200 or 400 mg; Bio Cimetidine, Lenamet OTC) or an intravenous/intramuscular injectable (200 mg/2 mL; Pharma-Q Cimetidine).[19] Tablet administrations are taken with meals, typically as 400 mg four times per day for four to eight weeks (with a maximum dose of 2.4 g per day) for Bio Cimeditine, or three times daily for a maximum of two weeks and not exceeding 800 for Lenamet OTC.[19] Tolerance may develop with use, thus limiting the efficacy of H2-receptor antagonists.[20]

Cimetidine may incur altered bowel movement, including diarrhoea and constipation, and fatigue, though it is rare.[24] Cimetidine, due to anti-androgenic activity, may predispose male patients to unwanted side-effects, such as gynocomastia, which is not present in other H2-receptor antagonists.[21,24,25] Furthermore, it is a cytochrome P450 inhibitor, which increases the risk of associated drug-drug interactions.[21,25] Relative contraindications include cases of QT prolongation, urinary retention, hepatotoxicity and glaucoma.[24]

Antacids and alginate-based treatments

Antacids may be an alternative or adjunct to PPIs in mild or intermittent cases, but should only be considered for immediate relief.[16,26] Antacids neutralise acid via buffering systems which further reduces pepsin activity.[21,26,27] However, antacids only work acutely and for a short duration, thus limiting their efficacy in management.[20,21] Various antacids can be used throughout the day to help reduce gastric acidity before or after meals depending on their formulations.[19] Although safe, notable side-effects may include diarrhoea (magnesium hydroxide), constipation (aluminium hydroxide), bloating and flatulence.[26,27] Common combinations of aluminium and magnesium hydroxide may leverage the counteracting gastrointestinal disturbances to prevent altered bowel movements.[27] Furthermore, inappropriate use may mask underlying conditions leading to the concern, thus preventing appropriate treatment.[26]

Alginate-based treatments, such as those combined with antacids, can be considered to reduce post-prandial-mediated refluxate regurgitation[16] due to their ability to form a physical barrier on top of the gastric contents which perturbs the acid pocket and protects mucosa.[20,26,28] Combinations include: sodium bicarbonate, sodium alginate and calcium carbonate (suspensions such as Gelacid and Gelusil Plus; 10 to 20 mL four times daily); aluminium hydroxide, magnesium hydroxide and simethicone (tablets such as Gelusil-S; 1 to 2 tablets up to eight times per day); and oxethazaine, aluminium hydroxide and magnesium hydroxide (suspensions such as Mucaine; 5 to 10 mL four times daily).[19] Adverse effects may include self-limiting bloating or gastrointestinal distress, with rare hypersensitivity reaction.[28]

Conclusion

GORD remains a chronic and increasing concern in the community that may reduce the quality of life of individuals. While PPIs are considered the first pharmacotherapeutic option for treatment, rational use is needed to ensure it does not mask potential underlying triggering factors or potentiate medication burden or unnecessary use. Appropriate medication and disease review is needed to ensure continued treatment is justified and works to the benefit of the patient. As a multifactorial disease, management should be considered carefully to ensure that underlying reasons for the occurrence thereof be mitigated, with pharmacotherapy affording support to resolve symptoms and underlying pathophysiological concerns.

Conflict of interest

The author has no conflict of interest to disclose.

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Pharmacological management of bacterial conjunctivitis in South Africa

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Abstract

Bacterial conjunctivitis is a common ocular condition that affects individuals across all age groups and is a significant cause of red eye in primary healthcare settings in South Africa. The condition is primarily caused by *Staphylococcus aureus*, *Streptococcus pneumoniae*, and *Haemophilus influenzae*. This article provides an overview of the current understanding of bacterial conjunctivitis in the South African context, covering epidemiology, clinical presentation, diagnosis, treatment, and emerging concerns such as antimicrobial resistance. The article also highlights the challenges within public healthcare facilities and the importance of local surveillance and standardised treatment guidelines to improve patient outcomes.

Keywords: bacterial conjunctivitis, pharmacological management

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Introduction

The conjunctiva is a transparent mucous membrane covering the anterior sclera and inner eyelids. Inflammation of this tissue, known as conjunctivitis, is characterised by vascular dilation, leading to redness, swelling, and often discharge.[1,2] Conjunctivitis can be classified as acute (lasting three to four weeks) or chronic (persisting beyond four weeks).[3] Infectious causes include viral, bacterial, and parasitic agents, while non-infectious forms may result from allergies, trauma, or chemical exposure.[3,4] Bacterial conjunctivitis typically presents with moderate to severe redness, mucopurulent discharge, and eyelid matting, whereas viral conjunctivitis manifests with milder redness, watery discharge, and minimal eyelid adherence.[5,6] Allergic conjunctivitis is distinguished by itching, tearing, and mild redness.[7]

Although acute conjunctivitis is frequently treated with topical antibiotics, evidence suggests that such therapy is often unnecessary.[8,9] In South Africa, pharmacological management is complicated by the over-the-counter (OTC) availability of ocular medications, with antibiotics dominating sales.[10,11] The misuse of antibiotics exacerbates antimicrobial resistance (AMR), a public health concern, particularly in low- and middle-income countries where resistance rates are high. Studies in Ghana, for instance, reveal widespread resistance to commonly prescribed antibiotics.[3]Community antibiotic use is estimated at 80%, with 20–50% deemed inappropriate, further fueling AMR.[4] Unnecessary antibiotic prescriptions also increase treatment costs, placing an additional burden on patients.[1] Thus, antibiotic stewardship remains important in managing bacterial conjunctivitis effectively.

Bacterial conjunctivitis continues to pose a public health burden in South Africa, particularly in underserved communities. While most cases are mild and self-limiting, effective diagnosis and timely treatment are crucial to avoid complications and reduce transmission. Enhancing diagnostic capabilities, updating treatment protocols, and addressing antibiotic resistance are key to improving outcomes.

Epidemiology of bacterial conjunctivitis in South Africa

Bacterial conjunctivitis is an ocular infection caused by pathogenic bacteria invading the conjunctiva, a thin mucous membrane covering the anterior eye and inner eyelids.[12] The infection triggers inflammation, leading to symptoms such as redness, grittiness, pain, and tearing. While bacterial conjunctivitis affects both children and adults, most cases are mild and resolve without requiring laboratory investigations. However, inappropriate management, particularly the misuse of topical antibiotics, can contribute to complications, including antimicrobial resistance (AMR).[13]

In South Africa, as in many other regions, the overuse of antibiotics classified under the "Watch" group in the AWaRe (Access, Watch, Reserve) classification system exacerbates resistance patterns.[13] These antibiotics are frequently prescribed for bacterial conjunctivitis and other ocular infections, despite growing concerns about their long-term efficacy. This highlights the need for improved antibiotic stewardship and education among healthcare providers and the public to curb unnecessary antibiotic use.

Children are particularly susceptible to bacterial conjunctivitis due to factors such as close contact during play, upper respiratory tract infections, and poor hygiene practices.[14] Additionally, the use of contaminated towels or ointments, as well as underlying conditions like malnutrition or sickle cell anaemia, can weaken ocular defenses, allowing normal flora or pathogens to proliferate.[12] Despite these risks, topical antibiotics remain the

primary treatment for bacterial conjunctivitis, emphasising the need for judicious prescribing to mitigate resistance development.

Pathophysiology of bacterial conjunctivitis

Bacterial conjunctivitis is primarily caused by pyogenic bacteria such as *Staphylococcus aureus, Streptococcus pneumoniae*, *Haemophilus influenzae*, and, in more severe cases, *Neisseria gonorrhoeae* and *Chlamydia trachomatis*.[15,16] The infection typically begins in one eye but often spreads to the contralateral eye due to contamination from touching the eyes with infected hands or contact lenses.[12] Common symptoms include ocular redness, grittiness, mucopurulent discharge (leading to crusting upon waking), and discomfort (Table I). In severe infections, systemic manifestations such as fever, malaise, and photophobia may occur.

The ocular surface harbours a dynamic microbiome that maintains ocular health, but disruptions in this balance, whether from environmental factors, host immunity, or antibiotic misuse, can predispose to infection.[17,18] Excessive antibiotic use further exacerbates the problem by promoting drug-resistant bacterial strains and diminishing protective microbial communities.[19] While *N. gonorrhoeae* and *C. trachomatis* remain notable pathogens, *Neisseria meningitidis* is a rare but serious cause of acute bacterial conjunctivitis. Transmission occurs primarily through hand-to-eye contact, exposure to contaminated fomites, or contact with genital or respiratory secretions. Although the conjunctiva is the usual entry point, infection can also spread from adjacent structures such as the eyelids, lacrimal system, or sinuses. Haematogenous spread is uncommon. Since clinical presentation alone cannot reliably identify the causative organism, microbiological testing is essential for targeted treatment.[15,16]

Common bacterial pathogens

Bacterial conjunctivitis is a common ocular infection characterised by inflammation of the conjunctiva, affecting both children and adults. While children are more frequently affected due to close contact in school settings, adults may develop the condition through occupational exposure, environmental irritants, or airborne particles.[3,4] The disease is highly contagious, facilitating rapid transmission in communal environments. The predominant bacterial pathogens responsible for conjunctivitis include *Staphylococcus aureus*, *Streptococcus pneumoniae*, *Haemophilus influenzae, Moraxella* species, *Chlamydia trachomatis*, and *Neisseria gonorrhoeae*[12] (Table I). However, increasing antibiotic resistance among these pathogens has raised concerns, necessitating the development of effective and well-tolerated topical treatments.

Studies in sub-Saharan Africa, including research conducted at the Malam Aminu Kano Teaching Hospital in Nigeria, have identified *S. aureus, Pseudomonas spp.*, and *Streptococcus spp.* as leading causative agents of bacterial conjunctivitis.[12] Diagnostic methods such as bacterial culture, Gram staining, and antimicrobial susceptibility testing were employed to confirm these findings. The study highlighted the importance of microbiological analysis in guiding appropriate antibiotic therapy, particularly in regions where empirical treatment is common. These findings underscore the need for ongoing surveillance of bacterial resistance patterns to ensure effective management of bacterial conjunctivitis in South Africa and similar settings.

Staphylococcus aureus

Staphylococcus aureus is a Gram-positive, coagulase-positive coccus that commonly colonises human skin and nasal passages, with approximately 30% of the population being permanent carriers.[20,21] This opportunistic pathogen is not restricted to humans but can also be found in animals such as livestock, posing transmission risks through farm workers or contaminated dairy products.[20] In healthcare settings, *S. aureus* spreads easily among workers, medical equipment, and patients, leading to outbreaks in hospitals and long-term care facilities.

Ocular infections caused by *S. aureus* include conjunctivitis, keratitis, blepharitis, endophthalmitis, and post-surgical infections, often complicating chemical injuries or trauma.[22,23] Staphylococcal conjunctivitis is typically bilateral, presenting with purulent discharge, conjunctival redness, and involvement of all conjunctival surfaces. In tropical regions, certain strains can cause cicatricial conjunctivitis, affecting the conjunctival fornices.[22]

As the second most common cause of bacterial conjunctivitis, *S. aureus* spreads through direct contact with infected secretions, contaminated surfaces, or hand-to-eye transmission.[21] The bacterium adheres to ocular epithelial cells via surface proteins (e.g. fibronectin-binding proteins, teichoic acids) and virulence factors (e.g. coagulase, enterotoxins), facilitating tissue invasion.[20] Its pathogenicity is further enhanced by antibiotic resistance mechanisms, including enzymatic drug inactivation, biofilm formation, and altered cell wall permeability.[23] These adaptive traits complicate treatment, emphasising the need for antimicrobial stewardship in managing staphylococcal conjunctivitis.

Streptococcus pneumoniae

Streptococcus pneumoniae is a Gram-positive, catalase-negative diplococcus that represents a cause of bacterial conjunctivitis in South Africa and across the African continent. With an estimated annual incidence of 30 cases per 100 000 individuals (approximately five new cases per 1 000 children per year), outbreaks frequently occur in daycare settings among preschool-aged children.[3] Predominant serotypes associated with conjunctivitis in South Africa include 6A (34%), 23F (15%), and 1 (9%), with serotypes 5, 6A, 12A, 15A, and 23F being particularly prevalent.[4]

The preferred treatment for pneumococcal conjunctivitis in South Africa typically involves topical antibiotics, with chloramphenicol 0.5% eye drops (applied hourly, then tapered to every two hours) being a first-line option.[12] Fluorometholone eye drops may also be used adjunctively for symptomatic relief of inflammation. Clinicians generally favour topical therapy due to its localised effect, reduced systemic side-effects, and faster recovery times compared to oral antibiotics.[13] Additionally, national treatment guidelines and institutional protocols often recommend topical regimens, reinforcing their widespread use.

The preference for topical treatment is further supported by healthcare providers' observations that patients on topical antibiotics experience quicker resolution of symptoms than those prescribed oral therapy.[19] However, in severe or complicated cases, systemic antibiotics may still be necessary. The reliance on topical treatments aligns with antimicrobial stewardship efforts to minimise unnecessary systemic antibiotic use and reduce the risk of resistance development.[15] Continued surveillance of pneumococcal serotypes and resistance patterns remains important to ensuring effective management strategies in South Africa's evolving epidemiological landscape.

Haemophilus influenzae

Haemophilus influenzae is a small, non-motile, Gram-negative bacillus first isolated in 1892 that requires enriched media (blood or chocolate agar) for cultivation.[24] While the introduction of the Hib vaccine has reduced invasive infections, *H. influenzae* remains an important cause of acute conjunctivitis, particularly in children under five years old.[25] The infection typically presents as bilateral hyperacute conjunctivitis with purulent discharge, often accompanied by fever and upper respiratory symptoms like rhinorrhoea.[26]

As part of the normal nasopharyngeal flora, *H. influenzae* can spread to the conjunctiva during respiratory infections. While often self-limiting, prompt treatment with topical antibiotics is necessary to prevent serious complications like keratitis and peri-orbital cellulitis.[25] The inclusion of *H. influenzae* conjugate vaccine in South Africa›s immunisation programme has reduced invasive disease, but conjunctival infections persist, particularly in settings with poor hygiene.[26] This underscores the need for continued vaccination efforts and appropriate antimicrobial management of ocular infections.

Clinical presentation

Bacterial conjunctivitis represents the most common form of conjunctival inflammation, characterised by acute onset of redness, swelling, and ocular discharge.[4] While acute conjunctivitis may result from various causes including viral infection, allergies, or chemical irritation, the bacterial form typically presents with distinctive yellow or green purulent discharge, often accompanied by eyelid swelling and mild itching. Although frequently self-limiting within seven to ten–1 days, proper diagnosis is important as inappropriate antibiotic use for non-bacterial cases contributes to antimicrobial resistance.[4] The classical presentation includes conjunctival injection and crusting of lashes, particularly upon waking. Treatment options range from cost-effective eye gels to more expensive but widely available antibiotic drops, with ointments generally being less preferred due to application difficulties and potential vision blurring. Accurate clinical differentiation between bacterial, viral, and allergic conjunctivitis remains essential before initiating any therapy. Figure 1 depicts clinical presentation.

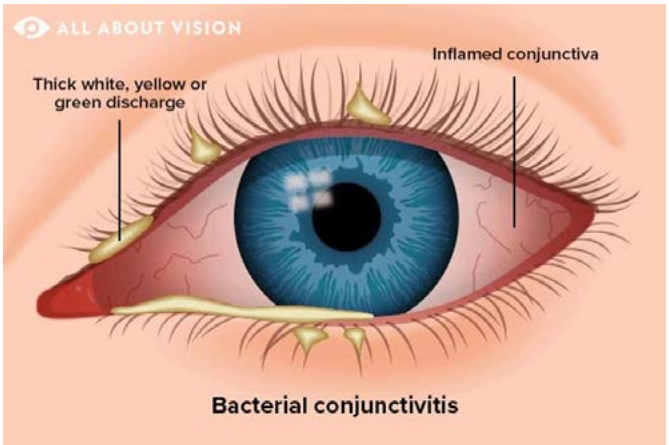

Figure 1: Presentation of bacterial conjunctivitis.[27]

Diagnosis of bacterial conjunctivitis

As one of the most frequent reasons for ophthalmology consultations globally (accounting for up to 5% of visits in the US), bacterial conjunctivitis requires careful diagnostic evaluation.[12] While many cases resolve spontaneously, acute bacterial presentations warrant targeted topical antimicrobial therapy, with systemic antibiotics reserved for severe cases, neonatal infections, or treatment failures. The diagnostic approach differs between primary care and specialist settings – general practitioners typically employ clinical classification while ophthalmologists utilise culture and sensitivity testing for refractory cases.[12]

Paediatric populations demonstrate higher susceptibility, with seasonal peaks during winter months contrasting allergic conjunctivitis' pollen-season predominance. Key diagnostic challenges include distinguishing infectious from non-infectious aetiologies, particularly in primary care settings where diagnostic resources may be limited. Effective management hinges on proper medication administration techniques, making patient education on correct eye drop instillation necessary for treatment success. The development of standardised guidelines for outpatient management, encompassing aetiology, clinical features, therapeutic options, and counselling points, would improve care quality while combating unnecessary antibiotic use in self-limiting cases.

Inquiries to make when interviewing a patient who may have bacterial conjunctivitis:[28]

- What time did the symptoms begin?
- Is one or both eyes impacted?
- Did it start with one eye?
- Do the eyes have any accompanying pain, soreness, or grittiness?
- Does itching accompany it?
- Is there any blurriness or change in the vision?
- Is it possible to describe the discharge? (Thick, coloured, watery)
- Have you recently had any symptoms similar to the flu or cold?
- Are you a contact lens user?
- Has the issue been encountered previously? (If so, what kind of treatment was received and when?)

- Has the situation affected any other members of the household?
- Have you taken any self-care steps?
- Do you suffer from any chronic diseases or conditions?

Pharmacological treatment options

Bacterial conjunctivitis, characterised by conjunctival inflammation with purulent discharge and ocular irritation, requires prompt diagnosis and appropriate treatment to prevent complications like chronic infection and visual impairment.[25] While viral cases are typically self-limiting, bacterial conjunctivitis often necessitates antibiotic therapy. Diagnosis relies on clinical presentation, though Gram stain and culture of ocular specimens remain the gold standard, despite being underutilised in practice.[29] Common treatment options include topical fluoroquinolones (e.g. 0.5% ciprofloxacin or ofloxacin) and fusidic acid as adjunct therapy.

Topical antibiotics

Despite approximately 65% of bacterial conjunctivitis cases resolving spontaneously, topical antibiotics remain overprescribed in South Africa, mirroring trends seen in other African nations like Ghana where inappropriate prescribing rates reach 83%.[13] This overuse stems from patient demand for rapid relief and inadequate adherence to clinical guidelines. While topical azithromycin exists, its high cost limits accessibility. Treatment compliance remains a challenge, influenced by prescription practices and medication affordability. In resource-limited settings, alternative therapies are needed to curb antibiotic resistance while ensuring effective management.

Oral antibiotics

Oral antibiotics are reserved for severe cases, neonates, or treatment failures. In South Africa, the widespread OTC availability of antibiotics like amoxicillin and tetracycline has led to indiscriminate use, exacerbating resistance.[13] Contact lens-related infections, particularly in urban areas like Cape Town, further complicate treatment due to high rates of fluoroquinolone resistance and the prevalence of virulent pathogens such as Chlamydia. The unregulated use of imported or counterfeit antibiotics worsens antimicrobial resistance, highlighting the urgent need for stricter prescription controls and updated treatment guidelines.

Adjunctive therapies

Adjunctive treatments for bacterial conjunctivitis are limited, as anti-inflammatory agents like corticosteroids and NSAIDs are generally discouraged due to risks of masking underlying infections or worsening bacterial virulence.[25] While topical antihistamines and cold compresses may alleviate symptoms, their role in bacterial cases is minimal. Off-label use of antivirals (e.g. ganciclovir) for viral conjunctivitis lacks evidence, and their efficacy remains uncertain. Current guidelines emphasise symptomatic relief with saline rinses and caution against unnecessary steroid or NSAID use in infectious conjunctivitis.

Measures to prevent the spread of bacterial conjunctivitis:[30]

Do's:

- Wash hands with warm water and soap
- Wash pillows, facecloths and towels in hot water
- Replace make-up brushes
- Complete the course of any treatment

Dont's:

- Do not share facecloths and towels
- Do not rub the eyes
- Do not use make-up until resolution of infection
- Do not share any tubes of the treatment prescribed

Antibiotic resistance

Bacterial conjunctivitis, characterised by ocular redness and mucopurulent discharge, contributes to the global clinical burden and typically requires antibiotic treatment.[13] However, the overuse of topical antibiotics, particularly without bacteriological confirmation, remains a major concern, especially in sub-Saharan Africa where data on prescribing practices are limited. In Ghana, a study evaluating 228 prescriptions at an eye hospital revealed

Table I: Clinical features, pathogens and treatment bacterial conjunctivitis in South Africa

Clinical Presentation	Common Pathogens	First-Line Antibiotics (Topical)	Alternative/Reserve Options	Notes
Acute onset, purulent discharge, eyelid crusting, conjunctival redness, ± mild chemosis	*Staphylococcus aureus*	**Chloramphenicol 0.5%** (1–2 hourly, then taper)	**Fusidic acid gel (BD)**	High resistance to erythromycin; MRSA requires culture-guided therapy
Hyperacute (copious purulent discharge), severe redness, ± preauricular lymphadenopathy	*Neisseria gonorrhoeae*	**Ceftriaxone (IM) + saline irrigation**	**Azithromycin (oral)**	Systemic therapy required; urgent ophthalmology referral
Mucopurulent discharge, bilateral, often in children, ± URI symptoms	*Haemophilus influenzae*	**Ciprofloxacin 0.3% (QID)**	**Ofloxacin 0.3% (BD–QID)**	Hib vaccine reduces invasive disease but not conjunctivitis
Chronic/follicular conjunctivitis, ± genital infection	*Chlamydia trachomatis*	**Azithromycin (oral, single dose)**	**Doxycycline (oral, 7d)**	Topical therapy ineffective; treat sexual partners
Contact lens-associated, severe pain, photophobia	*Pseudomonas aeruginosa*	**Ciprofloxacin 0.3% (hourly)**	**Gentamicin 0.3% (QID)**	Immediate lens discontinuation; risk of keratitis

that many patients received unnecessary antibiotic therapy, highlighting widespread inappropriate use.[13] This pattern underscores the urgent need for improved health professional and public education on conjunctivitis management to curb unnecessary antibiotic prescriptions and mitigate rising resistance.

Guidelines for antibiotic use

The inappropriate use of antibiotics for paediatric bacterial conjunctivitis presents a global challenge, with clinicians often prescribing topical antibiotics even for suspected viral cases.[13] In Ghana, despite national guidelines discouraging antibiotic use for unconfirmed bacterial conjunctivitis, prescribing remains rampant. This trend mirrors broader public health concerns about antimicrobial resistance (AMR), which could lead to an estimated 10 million annual deaths by 2050 if unaddressed. In South Africa, the widespread availability of first-line topical antibiotics and aggressive marketing of generics further complicate efforts to regulate OTC use.[13]

To address these issues, a proposed study at a Cape Town specialist eye unit aims to document current prescribing practices and evaluate their alignment with national and international guidelines. Such research is important for developing standardised protocols to promote rational antibiotic use in acute conjunctivitis, particularly in regions like West Africa where empirical data remain scarce. Without intervention, the continued misuse of antibiotics will exacerbate AMR, rendering first-line treatments ineffective and threatening global ocular health outcomes.

Complications

Bacterial conjunctivitis is usually self-limiting, but if untreated or severe it can lead to several complications. The most common includes keratitis (corneal inflammation), which may progress to corneal ulceration and scarring**,** resulting in permanent visual impairment.[31,32] Severe cases, particularly with pathogens like Neisseria gonorrhoeae or Pseudomonas aeruginosa, can cause rapid corneal perforation.[33] Other complications include chronic conjunctivitis, recurrent infections, and secondary spread to periocular tissues causing preseptal or orbital cellulitis.[31,34] In children and immunocompromised patients, these complications may be more pronounced, underscoring the importance of prompt diagnosis and appropriate antibiotic therapy.[31,34]

Prognosis

Uncomplicated bacterial conjunctivitis typically has an excellent prognosis, whether managed expectantly or treated with topical antibiotics.[35] Most cases resolve fully within 7–14 days, often sooner in mild disease, without lasting sequelae.[36] Complications are rare in the absence of corneal involvement or highly virulent organisms. However, if pathogens like Neisseria gonorrhoeae or Chlamydia trachomatis are involved, the risk of corneal damage or systemic spread increases, making early recognition and targeted therapy critical.[36]

Patient education and compliance

Effective management of bacterial conjunctivitis requires comprehensive patient education to ensure proper medication use and adherence to treatment regimens. Educating patients about the nature of the condition (commonly called "pink eye"), its expected duration, and characteristic symptoms is essential for therapeutic success.[29] Compliance can be enhanced through clear verbal instructions supplemented with visual aids such as pamphlets, posters, and demonstration videos. Proper administration techniques for eye medications must be emphasised, particularly for OTC preparations which are frequently misused. Follow-up monitoring, either via telephone or email for mild cases, helps assess treatment response, though severe symptoms like photophobia or pain warrant in-person evaluation.[29] Healthcare providers should implement disclaimers during remote consultations to mitigate liability concerns while maintaining quality care standards.

Poor compliance contributes to treatment failure and increased resistance. Key education points include:[37]

- Completing the full course of antibiotics
- Avoiding touching/rubbing the eyes
- Using separate towels and pillowcases
- Practicing proper hand hygiene
- Not wearing contact lenses during infection

In South Africa, health education campaigns through clinics, schools, and media can enhance public awareness.

Role of healthcare providers

Healthcare providers have a role in differentiating bacterial conjunctivitis – characterised by purulent discharge and conjunctival injection – from viral or allergic forms.[13] While topical antibiotics like sulfacetamide, aminoglycosides, and fluoroquinolones are effective for bacterial cases, their indiscriminate use contributes to antimicrobial resistance, particularly as most conjunctivitis cases are viral and self-limiting. South Africa's bifurcated healthcare system presents unique challenges: the under-resourced public sector struggles with inadequate facilities and staffing, while the better-equipped private sector remains inaccessible to many due to cost barriers.[13] This disparity extends to ophthalmic care, where most specialists practice privately, leaving public hospitals understaffed. These systemic constraints complicate efforts to implement standardised antibiotic stewardship programmes, despite the urgent need to curb resistance patterns emerging from inappropriate prescribing practices.

Cultural considerations in treatment

Cultural beliefs and traditional medicine practices in South Africa influence the management of bacterial conjunctivitis. Many patients initially seek treatment from traditional healers or use home remedies before consulting medical professionals,

potentially delaying appropriate care.[13] This delay can lead to complications, particularly in chronic cases that may have underlying systemic causes like tuberculosis. Healthcare providers must navigate these cultural practices sensitively while educating patients about evidence-based treatments. The widespread availability of OTC antibiotics further complicates management, as self-medication often leads to inappropriate use and antimicrobial resistance.

Impact of socioeconomic factors

Bacterial conjunctivitis remains a prevalent ocular condition in South Africa, disproportionately affecting low-income communities. Poor sanitation, limited access to clean water, and crowded living conditions contribute to its spread, particularly in urban informal settlements.[13] The condition typically presents with conjunctival hyperemia, purulent discharge, and eyelid matting, with bilateral involvement in half of cases. While management typically involves saline irrigation and topical antibiotics, socioeconomic barriers often prevent consistent treatment adherence.

South Africa's water quality issues, including chlorinated municipal water, may exacerbate ocular irritation and susceptibility to infections. This is compounded by the endemic presence of trachoma in some regions. Recent conjunctivitis outbreaks, primarily viral in origin, have strained already limited healthcare resources. Similar challenges exist in neighboring countries like Ghana, where eye care services are concentrated in urban centers, forcing rural patients to travel long distances for treatment.[13] These systemic barriers highlight the need for improved primary eye care services and community-based management strategies to address bacterial conjunctivitis effectively across all socioeconomic groups.

Public health implications

Conjunctivitis represents the most common ocular condition presenting to both primary and tertiary healthcare facilities in South Africa, placing a strain on the public health system.[13] The condition's management is frequently complicated by unnecessary antibiotic prescriptions, particularly for viral and allergic cases that would resolve spontaneously. This inappropriate use of topical antibiotics contributes to rising antimicrobial resistance while creating financial burdens for patients paying out-of-pocket for medications that often provide no therapeutic advantage over simple ocular lubrication.[13]

The conjunctiva's exposed anatomical position makes it particularly vulnerable to infection, leading to liberal use of broad-spectrum topical antibiotics in clinical practice. However, this approach represents a costly and often ineffective strategy for managing what is typically a self-limiting condition. Current prescribing patterns highlight the urgent need for antibiotic stewardship programmes and standardised treatment protocols to guide appropriate medication use.[13] Such measures could reduce unnecessary antibiotic exposure while maintaining therapeutic efficacy for true bacterial cases.

Emerging research into alternative treatment approaches, including nanotechnology-based delivery systems, may offer future solutions to the challenges of drug resistance.[13] However, immediate public health gains can be achieved through improved diagnostic accuracy, better prescriber education, and patient awareness campaigns emphasising the typically benign nature of most conjunctivitis cases. These measures would help conserve antibiotics for situations where they are truly indicated while reducing the economic and resistance-related burdens associated with current overprescribing practices.

Case studies from South Africa

Bacterial conjunctivitis in South Africa presents similarly to global patterns, with characteristic mucopurulent discharge, eyelid matting, and conjunctival injection.[13] While the condition is typically self-limiting, clinical practice often involves unnecessary antibiotic prescriptions, mirroring trends seen throughout Africa. Recent studies demonstrate concerning resistance patterns among common pathogens, particularly to frequently prescribed agents like erythromycin and fluoroquinolones. South African data reveals similar challenges to those documented in Nigeria and Ghana, where bacterial isolates show increasing resistance to first-line topical antibiotics.[13] This resistance profile complicates management in resource-limited settings where diagnostic capabilities are often unavailable to guide targeted therapy.

Comparative analysis with other regions

A Ghanaian study of 878 conjunctivitis cases revealed problematic prescribing patterns, with erythromycin (51%) and ciprofloxacin (26%) being most frequently prescribed despite known resistance concerns.[13] These findings align with South African experiences where broad-spectrum antibiotics are often used inappropriately for mild cases. Comparative analysis shows that low- and middle-income countries face particular challenges with antibiotic stewardship, as evidenced by resistance rates exceeding 25% for commonly used agents. The persistent use of higher-generation antibiotics not recommended for routine conjunctivitis management remains a regional concern, highlighting the need for standardised treatment guidelines across Southern Africa.[13]

Innovations in treatment

Various innovations in the medical sciences have been brought in recently to counter conjunctivitis. Gatifloxacin ophthalmic solution is a novel fourth-generation fluoroquinolone antibacterial drops for the topical treatment of bacterial conjunctivitis. By virtue of its broad-spectrum antibacterial activity against Gram-positive, Gram-negative, and atypical bacteria along with its high tolerability and safety profile, it has made its place as a preferred agent among the latest ocular antibiotics.[25] Various multi-centre clinical trials carried out internationally have demonstrated the efficacy and safety of gatifloxacin ophthalmic solution in the treatment of bacterial conjunctivitis. In addition, the treatment has been shown to possess an excellent pharmacokinetic profile along with a viable commercial available formulation.

Conjunctivitis, the inflammation of the conjunctiva, can be caused by a wide range of conditions, including infections. Infective conjunctivitis is a common ocular condition frequently managed at specialist or general eye clinics. *Streptococcus pneumoniae, Staphylococcus aureus, Moraxella species, Chlamydia trachomatis*, and *Neisseria gonorrhoeae*, are among the common organisms accounting for infectious conjunctivitis. Clinically, conjunctivitis, whether infectious or allergic, presents with redness, watering, and discharge.[13]

Limitations of current therapy

Current management of bacterial conjunctivitis in South Africa experiences challenges, particularly regarding antibiotic overprescription and emerging resistance.[13] While topical antibiotics remain the mainstay treatment, their inappropriate use for viral or self-limiting cases contributes to antimicrobial resistance. Children are particularly affected, with approximately 60% of paediatric conjunctivitis cases being bacterial in origin. The condition's high transmissibility in resource-limited settings, compounded by poor sanitation, creates substantial socioeconomic burdens. Current therapeutic approaches are further limited by the pyogenic nature of bacterial conjunctivitis and the rapid development of crusting discharge, which can complicate treatment adherence.[12]

Recommendations for practice

Effective management of bacterial conjunctivitis in South Africa requires strict adherence to evidence-based guidelines and antibiotic stewardship principles.[13] Despite existing guidelines, many practitioners remain unaware of or noncompliant with recommended protocols. To address this, concise, regularly updated treatment summaries should be made available to healthcare providers, particularly focusing on the following (see Figure 2):

- Accurate differentiation between bacterial, viral, and allergic conjunctivitis
- Appropriate first-line antibiotic selection
- Duration and frequency of topical therapy
- Recognition of resistant cases requiring alternative approaches

Pharmacists have a role in promoting rational antibiotic use and should receive ongoing education about current best practices. Treatment decisions must balance efficacy with affordability and accessibility within South Africa's healthcare system.

Enhancing healthcare team outcomes

With their distinct abilities and knowledge, doctors, nurses, and pharmacists all play important roles in the team-based approach to conjunctivitis treatment and management. In order to distinguish between the many causes of conjunctivitis, clinicians must recognise and diagnose its varied clinical manifestations. On the basis of their evaluations, they should seek consultations with ophthalmology. Nurses, on the other hand, are excellent at caring for and educating patients by using their knowledge. Pharmacists are essential in choosing the right drugs, verifying drug safety and interactions, and putting evidence-based treatment plans into practice.

All medical personnel are required to uphold the highest ethical standards, putting the autonomy and well-being of their patients first during the course of treatment. Sharing important information, talking about treatment plans, and delivering comprehensive patient-centred care all depend on effective interprofessional communication. By enabling smooth transitions between various stages of care and encouraging a unified approach to management, team member care coordination improves patient outcomes. When treating and controlling conjunctivitis, healthcare professionals can improve patient safety, team performance, and patient-centred care by combining their abilities, tactics, ethics, duties, interprofessional communication, and care coordination.

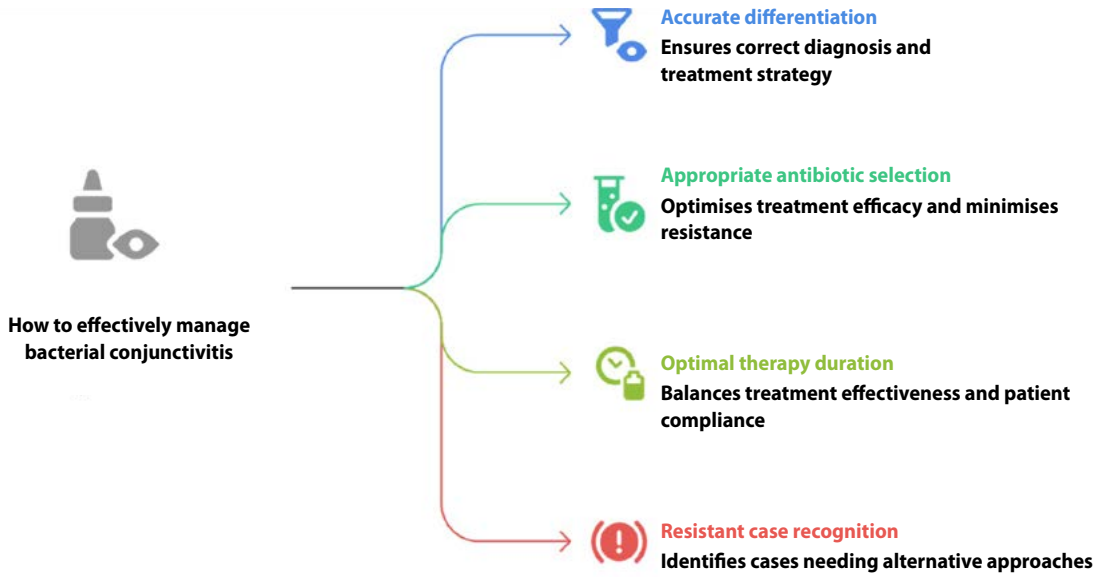

Figure 2: Management of bacterial conjunctivitis in South Africa

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- Prolonged screen use[1]
- Exposure to environmental factors*[1]
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INSTRUCTIONS FOR USE:

It is recommended to apply one drop into the conjunctival sac of the eye 3-4 times a day. More frequent applications can be done if needed.[1]

* Exposure to environmental factors such as wind, sun, dry air, salty water, smoke, dust, air conditioning and heating[1]

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To report an Adverse Event, e-mail Adcock.AEReports@adcock.com or call 011 635 0134. To request a copy of the current approved package insert or references, e-mail: Helpdesk.MedicalAffairs@adcock.com

Reference: 1. Xailin® Plus Package Insert, VisuFarma November 2021. **2.** Adcock Ingram Data on file. For full prescribing information refer to the approved package insert. **Applicant:** Genop Healthcare (Pty) Ltd. PO BOX 3911, Halfway House, 1685, South Africa. Tel 0861 436 674. Co. Reg. No. 1984/011575/07. www.genop.co.za. Marketed by Adcock Ingram Healthcare (Pty) Ltd. Reg. No. 2007/019928/07. Private Bag X69, Bryanston, 2021, South Africa. Tel +27 (00) 11 635 0000. www.adcock.com. 09/2025/PROMO/101

Conclusion

Bacterial conjunctivitis remains a public health challenge in South Africa, with substantial implications for individual patient care and broader antimicrobial stewardship efforts. The current epidemiological landscape reveals persistent gaps between clinical practice and evidence-based guidelines, particularly regarding antibiotic prescribing patterns. While Staphylococcus and Streptococcus species continue to dominate as causative pathogens, emerging resistance patterns—especially to fluoroquinolones—demand urgent attention in therapeutic protocols.

The socioeconomic impact of bacterial conjunctivitis in South Africa cannot be overstated. The condition's highly contagious nature leads to considerable productivity losses, particularly in vulnerable populations where crowded living conditions and limited access to clean water facilitate transmission. Children, who account for approximately 60% of cases, face disproportionate burdens including potential vision complications and school absenteeism.[13] These challenges are compounded by systemic issues in healthcare delivery, including inconsistent adherence to treatment guidelines and variable access to ocular medications across public and private sectors.

Future research should focus on developing context-appropriate treatment algorithms that account for South Africa's unique resistance patterns and healthcare infrastructure. Investment in novel therapeutic approaches, including potential vaccine development for high-risk populations, may offer long-term solutions. Ultimately, successful management of bacterial conjunctivitis will require collaboration across all levels of the healthcare system, from policy makers to frontline providers, to balance immediate clinical needs with the imperative of preserving antibiotic efficacy for future generations.

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The role of vitamin D in glycaemic control: a review of randomised controlled trials

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Abstract

Vitamin D deficiency and diabetes mellitus are both global health concerns with increasing prevalence. Recent research suggests a potential link between vitamin D status and the development and progression of various types of diabetes. This review aims to analyse the clinical evidence on the relationship between vitamin D supplementation and glycaemic control across different populations: individuals with prediabetes, type 1 diabetes (T1D), type 2 diabetes (T2D), and gestational diabetes mellitus (GDM). A systematic search of randomised clinical trials (RCTs) published from 2014 to 2024 was conducted in PubMed, Scopus, and Web of Science. Sixteen studies met the inclusion criteria. The findings were mixed. In prediabetes, vitamin D improved serum 25(OH)D levels, but effects on glycaemic parameters were inconsistent. In T1D, supplementation was associated with reduced insulin requirements and improved C-peptide levels, especially in children with vitamin D deficiency. T2D results were variable: some trials reported improvements in HbA1c and HOMA-IR, while others found no significant changes. In GDM, supplementation improved fasting insulin response and reduced adverse pregnancy outcomes. Overall, vitamin D supplementation shows potential benefits in certain contexts, particularly in T1D and GDM. However, heterogeneity in dosage, duration, and baseline characteristics limits the generalisability of findings. Further high-quality RCTs are needed to define optimal regimens and identify subpopulations most likely to benefit.

Keywords: Vitamin D, supplementation, diabetes mellitus, glycaemic control, randomised clinical trials

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Introduction

Diabetes mellitus (DM) encompasses a group of endocrine-metabolic disorders characterised by chronic hyperglycaemia due to insulin deficiency, resistance, or both. It is a major public health concern, with an estimated global prevalence of 537 million adults in 2021, projected to rise to 783 million by 2045.[1] Among the different forms of DM, type 2 diabetes (T2D) accounts for over 95% of cases, largely driven by sedentary lifestyles and obesity.[2] Type 1 diabetes (T1D) and gestational diabetes mellitus (GDM) also represent significant challenges. Vitamin D, a fat-soluble secosteroid hormone obtained through sun exposure, diet, or supplementation, has classically been associated with calcium homeostasis and bone health. However, growing evidence suggests its involvement in glucose metabolism, particularly through its influence on insulin secretion, beta-cell function, and inflammatory processes.[3] Vitamin D receptors (VDRs) are expressed in pancreatic beta cells, and active vitamin D [1,25$(OH)_2$D] may enhance insulin synthesis and secretion by modulating intracellular calcium levels.[4] Observational studies have consistently demonstrated associations between vitamin D deficiency and an increased risk of developing T2D and GDM, as well as poorer glycaemic control in established diabetes.[5-7] However, findings from interventional studies remain inconsistent, possibly due to differences in study design, dosage, baseline vitamin D status, and population characteristics. For example, while some trials reported improvements in glycaemic outcomes after vitamin D supplementation, others—including large-scale randomised trials—failed to demonstrate significant effects.[8-11] These discrepancies highlight the importance of a comprehensive evaluation of randomised clinical trial (RCT) evidence. Accordingly, this review examines RCTs published over the past decade to assess the role of vitamin D supplementation in glyca emic control among populations with prediabetes, T1D, T2D and GDM.

Methods

A literature search was conducted in PubMed, Scopus, and Web of Science databases to identify RCTs published between January 2014 and January 2024. The search was limited to studies conducted in humans, written in English or Spanish. The following Medical Subject Headings (MeSH) terms and keywords were used in various combinations: cholecalciferol, calcitriol, vitamin D, 1 alpha, 25 dihydroxycholecalciferol, and diabetes mellitus. Boolean operators (AND, OR, NOT) were applied to optimise the search strategy. Inclusion criteria were: (i) original RCTs; (ii) studies assessing the effects of vitamin D supplementation in individuals with prediabetes, T1D, T2D, or GDM; and (iii) articles reporting metabolic outcomes such as glycaemic control, insulin secretion or sensitivity, HbA1c, or beta-cell function. Exclusion criteria included: (i) observational studies, reviews, or meta-analyses; (ii) studies conducted in animals; (iii) studies not reporting relevant glycaemic outcomes; and (iv) duplicate publications. Duplicates were removed using Zotero reference management software (Zotero [Computer software]. Corporation for Digital Scholarship,

Roy Rosenzweig Center for History and New Media, Fairfax, Virginia, USA. Available at: https://www.zotero.org). A total of 16 studies met the inclusion criteria and were included for data extraction and qualitative analysis.

The study selection process is summarised in a flow diagram (Figure 1), adapted from PRISMA guidelines.[12]

Data from the included RCTs were independently extracted by two reviewers using a standardised template. For each study, the following variables were collected: authors, year of publication, study population (diabetes status), intervention details (dosage of vitamin D and duration), and primary metabolic outcomes (glycaemic control, HbA1c, insulin secretion or sensitivity, and β-cell function). Any discrepancies between reviewers were resolved through discussion and consensus.

Given the heterogeneity across studies in terms of design, populations, and intervention protocols, a quantitative synthesis (meta-analysis) was not feasible. Instead, a qualitative synthesis was performed. The analysis focused on grouping and narratively describing the findings according to diabetes type (prediabetes, T1D, T2D, GDM), dose and duration of vitamin D supplementation, and reported outcomes. Patterns, consistencies, and divergences between studies were highlighted to provide an integrated overview of the current evidence.

Results

A total of 16 RCTs were included, evaluating the effects of vitamin D supplementation on glycaemic outcomes in populations with prediabetes, T1D, T2D, and GDM. The studies varied in design, vitamin D dosage, intervention duration, and outcome measures.

Vitamin D and prediabetes

Five RCTs investigated the effects of vitamin D supplementation in individuals with prediabetes. Most studies reported significant increases in serum 25(OH)D levels following supplementation, with doses ranging from 4 000 to 88 865 IU/week over 8 weeks to 1 year.[13-17] However, glycaemic outcomes were inconsistent, as shown in Table I. One large-scale study found a reduced risk of progression to diabetes in participants maintaining serum 25(OH) D levels above 100 nmol/L.[14] In contrast, other trials reported no significant improvements in insulin sensitivity, insulin secretion, or glycemic control despite increases in vitamin D status.[15-17]

Vitamin D and Type 1 Diabetes

The role of vitamin D in T1D was assessed in three studies, mainly involving paediatric populations. These trials indicated that supplementation with 3 000 to 6 000 IU/day of cholecalciferol or alfacalcidol for periods ranging from 3 to 12 months led to reductions in daily insulin requirements and increases in C-peptide levels (Table II), suggesting improved beta-cell function.[18-20] In particular, one study highlighted a significant decrease in HbA1c among children with baseline vitamin D deficiency.[19]

Vitamin D and Type 2 Diabetes

Six RCTs evaluated vitamin D supplementation in patients with T2D. Results were mixed, as shown in Table III. Some trials

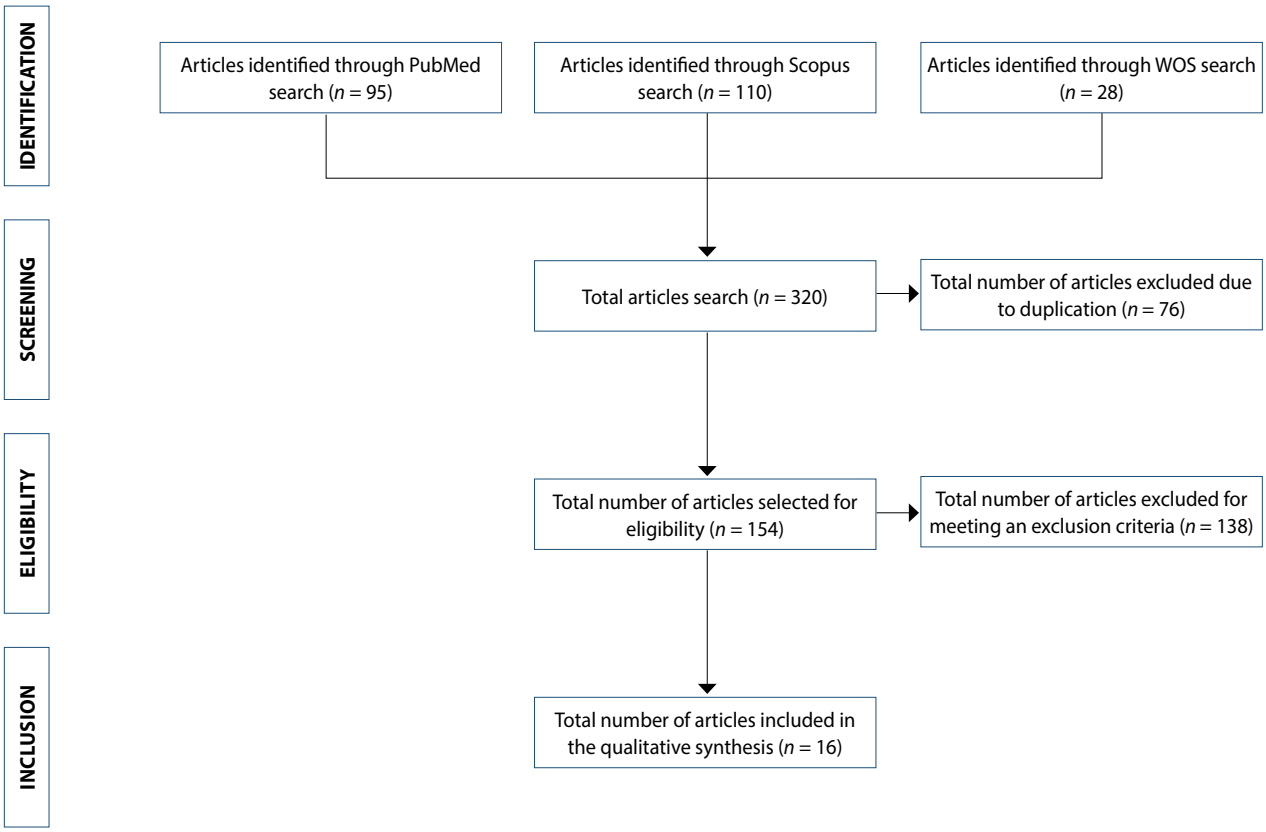

Figure 1: Flow diagram of study selection and inclusion in the qualitative synthesis (adapted from PRISMA 2020)

Table I: Summary of RCTs in prediabetes

Study	Population	Vitamin D Dose	Duration	Main Outcomes
Davidson et al. (2021)	58 prediabetics	35,714 IU/week	1 year	↑ 25(OH)D; no change in glycemic markers
Dawson-Hughes et al. (2020)	1 211 prediabetics	4,000 IU/day	6 months	↓ DM risk with high 25(OH)D
Gagnon et al. (2019)	46 prediabetics	2,000-6,000 IU/day	6 months	No sig. changes in insulin sensitivity
Mousa et al. (2020)	33 overweight adults	4,000 IU/day	16 weeks	No sig. changes in insulin/glucose
Wagner et al. (2018)	21 prediabetics	30,000 IU/week	8 weeks	↑ 25(OH)D; no glycemic benefit

Table II: Summary of RCTs in patients with type 1 diabetes

Study	Population	Vitamin D Dose	Duration	Main Outcomes
Ataie-Jafari et al. (2020)	31 adults	3,000 IU/day	12 months	↓ insulin dose; ↑ C-peptide
Giri et al. (2021)	43 children	6,000 IU/day	3 months	↓ HbA1c in vitamin D-deficient patients
Panjiyar et al. (2019)	42 children	3,000 IU/day	12 months	↓ fasting glucose and HbA1c

Table III: Summary of RCTs in patients with type 2 diabetes

Study	Population	Vitamin D Dose	Duration	Main Outcomes
Jehle et al. (2020)	29 adults	300,000 IU IM	1 dose	↓ HbA1c, HOMA-IR, albuminuria
Krul-Poel et al. (2021)	136 adults	50,000 IU/day	6 months	No sig. change in glycemic markers
Lemieux et al. (2018)	48 adults	5,000 IU/day	6 months	↑ M value and disposition index
Ryu et al. (2020)	79 adults	1,000 IU/day	24 weeks	No change in HbA1c or HOMA-IR
Strobel et al. (2019)	43 adults	1,904 IU/day	6 months	↑ 25OHD; insulin correlated with levels
Jorde et al. (2018)	256 adults	20,000 IU/week	5 years	No difference in DM incidence

Table IV: Summary of RCTs in patients with gestational diabetes

Study	Population	Vitamin D Dose	Duration	Main Outcomes
Asemi et al. (2020)	27 pregnant women	50,000 IU/week	6 months	↓ polyhydramnios and neonatal hyperbilirubinemia
Yeow et al. (2021)	13 pregnant women	4,000 IU/day	6 months	↑ insulin response; ↓ HbA1c

demonstrated improvements in insulin resistance (HOMA-IR), HbA1c, or beta-cell function following supplementation with 1 000–50 000 IU/day or 300 000 IU intramuscularly.[21,22] Other studies, however, did not find significant changes in glycaemic control, even in vitamin D-deficient individuals.[23-25] One large-scale, five-year study reported no effect on the incidence of T2D with 20 000 IU/week supplementation.[26]

Vitamin D and Gestational Diabetes Mellitus

Vitamin D supplementation in the context of GDM was investigated in two clinical trials, as shown in Table IV. Supplementation with 4 000–50 000 IU of vitamin D_3 led to improvements in fasting insulin response and modest reductions in HbA1c.[27,28] Additionally, one of the studies reported fewer adverse pregnancy outcomes, such as polyhydramnios and neonatal hyperbilirubinaemia, among those receiving vitamin D.[27]

Discussion

This review summarises the evidence from RCTs evaluating the effects of vitamin D supplementation in patients with prediabetes, T1D, T2D, and GDM. Overall, findings suggest that while vitamin D supplementation consistently raises serum 25(OH)D levels, its impact on glycaemic outcomes varies across populations and study designs.

In individuals with prediabetes, the majority of studies demonstrated a significant increase in vitamin D status without consistent improvements in insulin sensitivity, insulin secretion, or glycaemic control.[13-17] One large-scale RCT reported a reduced risk of developing diabetes in participants maintaining high serum 25(OH)D levels.[14] However, other trials with similar designs and dosages failed to replicate these effects.[15-17] Variability in baseline vitamin D status, intervention duration, and metabolic phenotype may explain the inconsistent results.

In T1D, particularly in paediatric populations, vitamin D supplementation appears more promising. Several studies observed reduced insulin requirements and preserved C-peptide levels following high-dose supplementation.[18-20] These findings align with mechanistic studies suggesting that vitamin D modulates beta-cell function and immune responses via VDR-mediated pathways.[4] Children with vitamin D deficiency seem to derive the greatest benefit,[19] indicating a potential role for targeted supplementation in this subgroup.

Evidence in T2D is more conflicting. Some studies reported improvements in HbA1c, HOMA-IR, and beta-cell function,[21,22] while others showed no significant changes in glycaemic parameters despite effective correction of vitamin D insufficiency.[23-25] A five-year trial failed to demonstrate any protective effect against

diabetes onset in high-risk individuals.[26] Differences in population characteristics, as well as variability in vitamin D dosage and duration, may contribute to these divergent results. The evidence suggests that while vitamin D may have modest metabolic effects in T2D, it is unlikely to serve as a standalone therapeutic strategy.

In GDM, supplementation was associated with improved insulin response and a modest reduction in HbA1c.[27,28] One study also reported lower rates of polyhydramnios and neonatal hyperbilirubinemia, suggesting broader maternal and neonatal benefits.[27] These findings support the role of vitamin D in pregnancy, where deficiency is prevalent and may contribute to insulin resistance and adverse outcomes.

Despite promising signals, the current body of evidence presents limitations. Heterogeneity across trials—regarding vitamin D formulations, dosing regimens, baseline vitamin D levels, duration, and outcome measures—hampers comparability and limits the ability to draw firm conclusions. Future research should focus on high-quality, well-powered RCTs that target specific subgroups, explore optimal dosing strategies, and include long-term metabolic and clinical outcomes.

Although our review focused exclusively on randomised controlled trials in humans, it is important to acknowledge evidence from animal models that supports the biological plausibility of vitamin D's role in glycaemic regulation. Preclinical studies in diabetic rat models have shown that vitamin D supplementation improves insulin secretion, reduces HbA1c levels, and ameliorates insulin resistance. For example, vitamin D treatment in diabetic rats increased serum insulin and reduced HbA1c, with even greater improvements when combined with glimepiride, nearly restoring insulin levels to those of non-diabetic controls.[29] Similarly, vitamin D supplementation significantly improved both hyperglycaemia and hypoinsulinaemia in streptozotocin-induced diabetic rats.[30] Other investigations demonstrated that vitamin D deficiency impairs pancreatic islet insulin secretion and β-cell function, while supplementation restores secretory capacity through vitamin D receptor (VDR)-mediated pathways.[31,32] These preclinical findings provide important mechanistic context and reinforce the notion that future integrative analyses—including both human and animal data—may enhance understanding of the causal pathways underlying the observed associations.

Since diabetes frequently occurs as part of the metabolic syndrome, future studies should also evaluate whether vitamin D deficiency influences the prevalence of comorbidities such as hypertension, dyslipidaemia, and central obesity. Addressing these broader cardiometabolic endpoints may clarify whether vitamin D supplementation exerts benefits beyond glycaemic control.[33,34]

Conclusions

Vitamin D supplementation effectively improves serum 25(OH) D levels across populations with prediabetes, T1D, T2D, and GDM. However, its impact on glycaemic control varies. The most consistent evidence of benefit is seen in T1D and GDM, where supplementation may improve beta-cell function, insulin response, and pregnancy outcomes. In prediabetes and T2D diabetes, findings are more heterogeneous, with some studies reporting modest metabolic improvements and others showing no significant effects.

Current evidence does not support universal vitamin D supplementation as a primary strategy for glycaemic control in diabetes. Nonetheless, it may serve as a valuable adjunct in individuals with documented deficiency or specific clinical contexts. Future high-quality randomised trials are needed to define optimal dosing, identify responsive subgroups, and establish long-term benefits.

Conflict of interest

The authors declare they have no conflicts of interest that are directly or indirectly related to the research.

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Osteoporosis in South Africa: an emerging silent epidemic

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Abstract

Osteoporosis is a progressive skeletal disorder characterised by reduced bone strength and an increased risk of fragility fractures. It arises from qualitative and quantitative changes in bone – including low bone mineral density (BMD), altered macro- and microarchitecture, and impaired bone remodelling – and is now recognised as a major cause of morbidity and mortality worldwide.[1,2]

Globally, osteoporosis predominantly affects postmenopausal women, but the burden in men is increasingly acknowledged. International data suggest that 1 in 3 women and 1 in 5 men over 50 years will sustain an osteoporotic fracture, with hip and vertebral fractures driving excess disability, loss of independence and premature death. Up to 37 million fragility fractures occur annually in people older than 55 years, equating to around 70 fractures every minute.[3]

In sub-Saharan Africa (SSA), osteoporosis and osteopenia are more common than previously appreciated, with emerging evidence from South Africa and neighbouring countries highlighting high fracture rates, an ageing population, the impact of HIV, and persistent barriers to diagnosis and treatment.[1,4,5]

South African data show high one-year mortality after hip fracture, limited access to dual-energy X-ray absorptiometry (DEXA), and underdiagnosis and undertreatment of osteoporosis, particularly in the public sector.[1,4]

This review summarises the epidemiology and impact of osteoporosis in South Africa, outlines the diagnostic approach (including the role of DEXA and FRAX-based fracture risk tools), reviews key lifestyle and pharmacological management principles, and provides practical, context-specific recommendations for clinicians and pharmacists. Early identification of high-risk patients and evidence-based, resource-appropriate management remain essential to reduce the growing fracture burden in South Africa.

Keywords: osteoporosis, emerging silent epidemic, global burden

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Introduction and global burden

Osteoporosis is a skeletal disease characterised by reduced bone strength and an increased susceptibility to low-trauma fractures. Although the term is often equated with low BMD, bone fragility also reflects small bone size, unfavourable macroarchitecture (e.g. a long, thin femoral neck), disruption of trabecular microarchitecture, cortical porosity, impaired bone material properties and reduced viability of osteocytes.[2] Over time, these changes culminate in fragility fractures following minimal trauma, such as a fall from standing height.[2]

Because bone loss is asymptomatic, osteoporosis is frequently described as a "silent epidemic" and often remains undetected until a fracture occurs.[1] The consequences are substantial: fragility fractures are associated with chronic pain, functional decline, loss of independence, institutionalisation and excess mortality, particularly after hip fractures.[1,6]

Globally, osteoporosis is highly prevalent in ageing populations. Based on the WHO definition, approximately 6.3% of men and 21.2% of women over 50 years have densitometric osteoporosis, and 32 million people aged 50+ in Europe alone are estimated to have the disease. Worldwide, 1 in 3 women and 1 in 5 men above 50 years will experience an osteoporotic fracture, with up to 37 million fragility fractures annually in those older than 55 years.[3]

The impact of osteoporosis compares unfavourably with many other chronic diseases. In European data, the disability burden due to fragility fractures exceeds that of most cancers (except lung cancer) and is comparable to or greater than that associated with several major non-communicable diseases, including rheumatoid arthritis, asthma and hypertensive heart disease. When disability-adjusted life years (DALYs) associated with fragility fractures are compared with 16 other non-communicable diseases across multiple European countries, fragility fractures rank fourth, after ischaemic heart disease, dementia and lung cancer. The combined lifetime risk of hip, forearm and clinical vertebral fractures is around 40%, similar to the risk of cardiovascular disease.[3]

Despite this, patient and clinician awareness remains suboptimal. IOF survey data demonstrate denial of personal risk among postmenopausal women, limited dialogue with healthcare providers, and restricted access to diagnostic and preventive care, all of which contribute to underdiagnosis and undertreatment.[3]

Osteoporosis in Sub-Saharan Africa and South Africa

Sub-Saharan Africa: Shifting epidemiology

For decades, osteoporosis in SSA was thought to be rare. Early South African data from the 1960s contributed to the misconception that fragility fractures did not occur frequently in Black African populations.[4] More contemporary studies have

challenged this paradigm, demonstrating that osteoporosis and osteopenia are common in older adults in SSA, with fracture rates predicted to double between 2010 and 2040.[4,5]

SSA is undergoing rapid demographic and epidemiological transition. The older adult population in Africa is projected to increase from 74.1 million in 2020 to 235.1 million by 2050.[1] In low- and middle-income countries (LMICs), more than 1 billion people are already older than 60 years, with life expectancy rising more rapidly in Africa than on any other continent.[4] At the same time, urbanisation, changing diets, reduced physical activity and increased non-communicable disease (NCD) prevalence are driving higher rates of osteoporosis and fragility fractures. Musculoskeletal conditions overall account for more years lived with disability than cancer and cardiovascular disease combined.[4]

Chronic infections, particularly HIV, further complicate the picture. Southern Africa is home to approximately 20.6 million people living with HIV. With successful antiretroviral therapy (ART), HIV is now a chronic disease of ageing in SSA. Long-term HIV infection is associated with immune dysregulation, chronic inflammation ("inflammaging"), premature ageing and increased fracture risk, potentially exacerbated by some ART regimens.[4] Studies suggest that older South African women living with HIV may experience greater postmenopausal bone loss than HIV-negative peers, underscoring the need to incorporate bone health into long-term HIV care.

South Africa: Local prevalence and outcomes

South African data illustrate the substantial burden of osteoporosis and fragility fractures. Hip fractures in South Africa are associated with approximately 30% one-year mortality – higher than the ~20% reported in many international cohorts – and more than half of patients never regain pre-fracture levels of independence. Between 15% and 29% require admission to frail-care facilities after a hip fracture.[1]

The country's multi-ethnic population and two-tier health system (public and private) create marked disparities in access to diagnosis and treatment. DEXA scanning, the gold standard for BMD measurement, is usually limited to tertiary centres, particularly within the public sector, leaving a large proportion of at-risk patients unassessed.[1,4]

Population-based studies have identified ethnic and sex differences:

- South African data show higher hip fracture incidence in White and Indian populations compared with Coloured and African populations.[1]
- A study by Paruk et al. reported age-adjusted hip fracture rates of 69.2 per 100 000 per year in Black South African women and 73.1 per 100 000 per year in Black South African men, dispelling earlier assumptions that fragility fractures were rare in Black Africans.[1]
- In women, vertebral fractures on DEXA may be the only sign of established osteoporosis and strongly predict future fractures. Conradie et al. found vertebral fracture rates of 9% in Black women and 5.1% in White women, suggesting a comparable vertebral fracture burden across ethnic groups.[1]

A recent Johannesburg tertiary-centre study of patients referred for DEXA scans found an overall osteoporosis prevalence of 38.8% (CI 38.6–40.8%) among 2 264 scans, with 880 patients classified as osteoporotic (96.4% female, 3.6% male) (Anavi 2025). Prevalence increased with age, and low body mass index (BMI) was strongly associated with lower T-scores and more severe osteoporosis. Thoracic vertebra T12 had the highest prevalence of vertebral fractures. Interestingly, the prevalence of osteoporosis among men in this referred population was 32.3%, substantially higher than global estimates (~11.7%), likely reflecting referral bias but nonetheless highlighting a significant male burden.[1]

In rural South Africa, cross-sectional data suggest that osteoporosis, rather than sarcopenia, is the predominant musculoskeletal disease of ageing, with high HIV prevalence compounding bone health risk.[5] Older women living with HIV appear particularly vulnerable to low BMD. Across African cohorts, urban South African women have the highest osteoporosis prevalence, comparable to US White women and higher than US Black and UK White women, while urban Zimbabwean women show a two- to four-fold lower prevalence.[4]

Overall, osteoporosis remains underdiagnosed and undertreated in South Africa.[1,4] Limited awareness among healthcare professionals and the public, constrained access to DEXA, and gaps in treatment reimbursement all contribute to missed prevention opportunities.

Risk factors and pathophysiology

Bone is a dynamic tissue that undergoes continuous remodelling. Osteoclasts resorb older bone, while osteoblasts form new bone at the same site. Osteocytes, terminally differentiated osteoblasts embedded within the mineralised matrix, sense mechanical strain and orchestrate this remodelling process.[2]

Osteoporosis develops when this delicate balance is disrupted: either bone resorption is excessive relative to need, or bone formation is inadequate to repair resorption cavities. Low peak bone mass (usually achieved by the third decade of life) increases vulnerability later in life. With advancing age, additional factors such as declining sex steroids, reduced physical activity, oxidative stress, chronic inflammation, glucocorticoid exposure and an increased tendency to fall further heighten fracture risk.[2]

General risk factors

Common clinical risk factors include:[1,6,7]

General risk factors	Chronic Disease	Medication
• **Age and sex**: risk increases with age; postmenopausal women are most affected, but men are also at substantial risk. • **Low BMI and underweight**: consistently associated with low BMD and higher fracture risk. • **Early menopause** (e.g. < 45 years) or hypogonadism. • **Family or personal history of fragility fracture**, particularly hip or vertebral fracture. • **Lifestyle factors**: smoking, physical inactivity, excessive alcohol intake, poor dietary calcium and vitamin D intake. • **Nutritional factors**: chronic undernutrition, low calcium and vitamin D, and broader micronutrient deficiencies.	• Endocrine disorders (hyperthyroidism, Cushing's disease, poorly controlled diabetes). • Chronic inflammatory and autoimmune conditions (rheumatoid arthritis, inflammatory bowel disease, chronic lung disease). • Chronic hepatic or renal disease. • Neurological disorders (e.g. multiple sclerosis) and conditions that increase fall risk. • Malabsorption syndromes and severe vitamin D deficiency.	• **Oral glucocorticoids**. • Certain **anticonvulsants**. • Some **thyroid preparations** (when causing overtreatment). • **Cancer therapies**, including chemotherapy and gonadal hormone suppression. • Potent **immunosuppressive agents**.

In SSA, HIV infection, ART exposure, high adiposity, recurrent infections and malnutrition contribute to chronic low-grade inflammation ("inflammaging"), which is linked to impaired musculoskeletal health. Rapid urbanisation alters physical activity and dietary patterns, often reducing dietary diversity and undermining calcium and vitamin D intake.[4]

Diagnostic Approach

Bone mineral density assessment

Dual-energy X-ray absorptiometry (DEXA/DXA) remains the gold standard for BMD measurement and densitometric diagnosis of osteoporosis.[1] BMD values are expressed as T- and Z-scores:[1]

- **T-score**: number of standard deviations (SD) a patient's BMD deviates from the young adult reference mean. The WHO defines osteoporosis as a T-score ≤ –2.5. T-scores are used in postmenopausal women and men aged ≥50 years.
- **Z-score**: number of SD a patient's BMD deviates from the age- and sex-matched mean. Z-scores are preferred in premenopausal women and men younger than 50 years.

Reference data are derived from the National Health and Nutrition Examination Survey (NHANES) for Caucasian women aged 20–29, using femoral neck BMD as the WHO-recommended site.[8]

Importantly, many fragility fractures occur in individuals without densitometric osteoporosis; that is, BMD alone does not fully capture fracture risk. Clinical risk assessment is therefore essential to complement DEXA.[2]

South African studies highlight a high prevalence of osteoporosis among patients referred for DEXA, especially older adults and postmenopausal women, and demonstrate a strong link between low BMI and more severe disease.[1]

Fracture risk estimation: FRAX and South African models

In settings where DEXA access is limited, fracture risk calculators play a particularly important role. The FRAX® tool integrates clinical risk factors (age, sex, BMI, prior fracture, parental hip fracture, glucocorticoid use, smoking, alcohol and rheumatoid arthritis) with or without BMD to estimate 10-year fracture probabilities.

FRAX models have now been calibrated for South African populations, allowing more accurate estimation of major osteoporotic and hip fracture risk. These locally adapted FRAX tools can be used to:[9]

- Identify high-risk patients when DEXA is not available.
- Prioritise referrals for DEXA in resource-constrained settings.
- Guide treatment decisions, particularly in patients with osteopenia

Given the silent nature of osteoporosis and low access to densitometry, FRAX and similar tools offer a pragmatic strategy to broaden fracture risk assessment beyond tertiary centres.

Barriers to diagnosis in SSA and South Africa

Multiple system-level obstacles limit early diagnosis:[1,4]

- Low awareness among clinicians and patients.
- Limited specialist services (e.g. rheumatology, endocrinology, geriatrics). South Africa has approximately one geriatrician per 275 000 older adults, and some SSA countries have none.
- Restricted DEXA availability, especially outside urban tertiary hospitals.
- Long travel distances, costs, and weak service integration in rural and peri-urban areas.

In such contexts, wider use of clinical risk tools, opportunistic case-finding (e.g. in HIV clinics or chronic disease programmes), and simple fracture-risk algorithms are essential to identify patients who may benefit from investigation and treatment.

Management of Osteoporosis

Effective osteoporosis management rests on three pillars:[10,11,12,13]

1. **Lifestyle and non-pharmacological measures.**
2. **Optimising calcium and vitamin D.**
3. **Appropriate pharmacological therapy guided by fracture risk.**

International guidelines broadly align on these principles, with local adaptation required for the South African context.[10,11,12,13]

Lifestyle and non-pharmacological strategies

All patients at risk of osteoporosis or fragility fracture should receive counselling on lifestyle measures[10,11,12,13]

- **Physical activity:** Regular weight-bearing and muscle-strengthening exercise tailored to individual ability (e.g. walking, stair climbing, resistance training). Balance and strength programmes reduce falls and associated fractures.
- **Smoking cessation:** Smoking is associated with lower BMD and approximately 55% higher hip fracture risk than in non-smokers.
- **Alcohol moderation:** Advise limiting intake to ≤2 units/day.
- **Falls prevention:**
  - Correct reversible visual impairment.
  - Review medications that increase fall risk (sedatives, antihypertensives, hypoglycaemics).
  - Encourage safe footwear and home hazard assessment (loose rugs, poor lighting).
- **Nutrition:** Ensure adequate protein, calcium and vitamin D intake; promote a balanced diet with fruits, vegetables and whole foods.

These interventions are safe, cost-effective, and particularly important in LMICs where access to medications and DEXA is constrained.

Calcium and vitamin D

Most guidelines recommend a **total daily elemental calcium intake of around 1 000–1 200 mg** and **vitamin D 800–1 000 IU** in adults at risk of osteoporosis or on anti-osteoporotic treatment. Dietary sources are preferred; supplements are used where intake is inadequate or where deficiency is documented.

Before initiating pharmacotherapy, it is good practice to:

- Check serum calcium, creatinine and 25-hydroxyvitamin D.
- Correct vitamin D deficiency (with re-testing after ± 8 weeks).
- Ensure adequate ongoing calcium and vitamin D intake to support treatment response and reduce hypocalcaemia risk, particularly with agents such as denosumab.

Pharmacological therapy

Indications for pharmacotherapy typically include:[10,11,12,13]

- Established osteoporosis (T-score ≤ –2.5 at hip, lumbar spine or 33% radius).
- Prior hip or vertebral fragility fracture (or certain non-vertebral fractures in the presence of low BMD).
- Osteopenia (T-score between –1.0 and –2.5) with a FRAX 10-year risk above the country-specific treatment threshold (e.g. ≥ 3% for hip fracture or ≥ 20% for major osteoporotic fracture in US data).

First-line antiresorptive therapy

For most postmenopausal women and men aged ≥ 50 years at high fracture risk, guidelines recommend oral bisphosphonates as initial therapy:[10,11,12,13]

- **Alendronate** or **risedronate** (weekly or monthly oral dosing).
- **Zoledronic acid** as an intravenous option, especially after hip fracture or where oral therapy is not suitable.

These agents reduce vertebral and non-vertebral fractures and have extensive long-term safety data.

Other antiresorptive options

- **Denosumab** – a RANKL inhibitor given 6-monthly subcutaneously; useful for patients unable to take bisphosphonates or with severe osteoporosis. Treatment discontinuation without follow-on bisphosphonate is associated with rebound vertebral fractures, so long-term planning is essential.
- **Selective oestrogen receptor modulators (SERMs)** such as raloxifene – particularly for spine-predominant osteoporosis in younger postmenopausal women with low risk of venous thromboembolism.
- **Hormone replacement therapy (HRT)** – effective in reducing postmenopausal bone loss and fractures, but now generally reserved for women ≤60 years with menopausal symptoms and low baseline risk for breast cancer and thromboembolism.

Anabolic or uncoupling therapies[10,11,12,13]

In very high-risk patients – for example, those with multiple vertebral fractures, very low T-scores (≤ –3.0) or rapid bone loss – anabolic or dual-action agents may be considered

These agents are typically given for a fixed duration (e.g. 12–24 months) and should be followed by antiresorptive therapy to maintain gains in BMD.

South African and SSA treatment barriers

In SSA, and particularly in the South African public sector, treatment access is severely limited:[4]

- Few anti-osteoporotic medicines are available on national formularies. Bisphosphonates, are not routinely stocked in many public hospitals.
- The WHO Essential Medicines List does not include standard osteoporosis treatments (e.g. oral bisphosphonates or HRT for fracture prevention), contributing to their omission from national lists. By contrast, intravenous zoledronate appears on the list for cancer-related skeletal events, but not for fragility

fracture prevention

- Private medical schemes may reimburse treatment only in severe osteopenia/osteoporosis with fractures; osteoporosis is often not considered a primary benefit, discouraging proactive screening.

Addressing these inequities, by including basic osteoporosis therapies on essential medicine lists, integrating bone health into chronic disease and HIV programmes, and improving access to rehabilitation and physiotherapy – is critical for South Africa and SSA.[4]

Monitoring and follow-up

Monitoring aims to assess response, reinforce adherence and reconsider therapy when necessary:[2,12]

- **DEXA scanning:** Repeat hip and spine DEXA roughly 1–2 years after initiating therapy. If BMD is stable or improved, intervals can be extended (e.g. every 2–5 years, depending on risk). Progressive loss beyond the least significant change or a new fracture on therapy should trigger reassessment and possible treatment modification.
- **Biochemical monitoring:** Periodic checks of serum calcium, renal function and 25-hydroxyvitamin D are advised, especially in patients on bisphosphonates, denosumab or with comorbid renal disease.
- **Adherence and persistence:** Non-adherence is common with oral bisphosphonates due to stringent dosing instructions and gastrointestinal adverse effects. Pharmacists are well placed to identify poor adherence, manage adverse effects and counsel on correct administration.
- **Treatment review:**
  - Consider "drug holidays" after 3–5 years of bisphosphonate therapy in low-to-moderate risk patients (Endocrine Society).

    In very high-risk patients or those with incident fractures on treatment, assess for secondary causes, optimise adherence and consider switching to anabolic agents or more potent antiresorptives.
- **Interdisciplinary care:** Coordination between primary care, endocrinology/rheumatology, orthopaedics, HIV clinics, physiotherapy and pharmacy is important to optimise fracture prevention and rehabilitation.

Practical Considerations for Clinicians and Pharmacists

In the South African context, clinicians and pharmacists can play a pivotal role in case-finding, education and safe, cost-effective treatment. Key practical steps include:[1,4,5,9]

1. Identifying high-risk patients:

- Adults ≥ 65 years (women) and ≥ 70 years (men), especially with additional risk factors (NOFSA screening recommendations.
- Patients with prior fragility fractures or family history of hip fracture.
- Long-term oral glucocorticoid users, those on anticonvulsants or other high-risk medicines.
- Persons living with HIV, particularly postmenopausal women or older men

2. Using simple risk tools:

- FRAX (with or without BMD) to quantify fracture risk in primary care
- Locally adapted osteoporosis risk questionnaires in settings without access to FRAX or DEXA.

3. Counselling on lifestyle and supplements:

- Reinforce weight-bearing exercise, smoking cessation, alcohol moderation and falls prevention.
- Discuss achievable dietary sources of calcium and vitamin D, and safe supplement use where needed.

4. Optimising medication use:

- Educate patients on correct bisphosphonate administration (e.g. taking tablets on an empty stomach with water, remaining upright for at least 30 minutes).
- Review medication lists for agents that compromise bone health or increase fall risk, and discuss alternatives with prescribers where appropriate.

5. Pharmacoeconomic stewardship:

- Advocate for cost-effective first-line therapies (e.g. generic alendronate) in formularies.
- Highlight the long-term cost savings associated with fracture prevention compared to acute fracture care and institutionalisation.

Future Directions and Research Needs

Key gaps relevant to South Africa and SSA include:[1,4]

- **Epidemiological data:** Few robust, nationally representative osteoporosis prevalence and fracture incidence studies exist for South Africa. More local data are needed to inform FRAX thresholds, resource allocation and policy.
- **Access to diagnostics:** Expanding DEXA availability in the public sector is unlikely in the short term; research into validated low-cost screening tools and portable technologies is needed. **Integration into chronic disease models:** Incorporating osteoporosis assessment into existing HIV, diabetes, hypertension and geriatric programmes may be a pragmatic way to identify high-risk patients.
- **Health economics and adherence:** Local cost-utility analyses comparing treatment strategies, and real-world adherence and persistence studies, would support rational formulary decisions and guideline adaptation.

Reprioritisation towards care of ageing populations and equitable access to bone-health services is urgently required in SSA.

Conclusion

Osteoporosis is a major, yet often invisible, contributor to morbidity and mortality in South Africa. As the population ages and the burden of NCDs and HIV-related comorbidities

grows, fragility fractures will place increasing strain on already stretched health systems. Evidence from SSA and South Africa shows that osteoporosis and osteopenia are common, hip and vertebral fractures carry substantial mortality and disability, and large segments of the population lack access to diagnostic and therapeutic services.[1,4,5]

Early identification of high-risk individuals, systematic fracture-risk assessment (including use of South African FRAX models), lifestyle optimisation, adequate calcium and vitamin D intake, and appropriate pharmacological therapy are essential to reduce fracture burden. Clinicians and pharmacists in both public and private sectors play a crucial role in case-finding, patient education, adherence support and advocacy for equitable access to basic osteoporosis care.

In conclusion, those living in SSA do not yet have equitable access to diagnostic and treatment options for osteoporosis, despite the high prevalence of low bone mass and fragility fractures. Awareness is increasing, but sustained effort is required to co-develop context-appropriate diagnostic pathways and treatment strategies with communities and stakeholders. Reprioritising bone health within broader healthy-ageing agendas, and ensuring affordable access to essential diagnostics and medicines, must become a key goal for policy-makers and healthcare providers in South Africa and the region.

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The pill and the profession: the evolving role of pharmacists in oral contraceptive access for women in South Africa

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Abstract

Oral contraceptives (OCs) play a key role in reproductive health and family planning, yet their use and accessibility in South Africa remain shaped by sectoral dynamics, socioeconomic factors, and persistent systemic barriers. Nationally, the prevalence rate of contraceptive use is estimated at around 60% among women of reproductive age. Injectables dominate public-sector provision while OCs are more frequently accessed in the private sector. Within the public sector, free combined oral contraceptive (COCs) and progestin-only pill (POPs) are available, although counselling and patient support are often limited. In contrast, the private sector provides a wider range of formulations, including extended-cycle regimens, but affordability and medical aid coverage remain decisive factors. Certain (emergency contraception) ECs are legally available for non-prescription access in community pharmacies, yet studies indicate poor awareness and low utilisation among adolescents and socioeconomically disadvantaged groups. Pharmacists are strategically positioned as accessible healthcare providers, offering both dispensing and counselling services. However, their role is undermined by limited training recognition, regulatory restrictions, and stigma surrounding EC provision, often reinforced by overly restrictive Good Pharmacy Practice (GPP) requirements. Contraceptive use often comes with complications such as adherence difficulties and side-effects like nausea and breakthrough bleeding, as well as risks such as venous thromboembolism (VTE). Despite these challenges, pharmacists express readiness to expand their role within primary health care, aligning with South Africa's broader shift toward universal health coverage. This review highlights the importance of strengthening pharmacist-led contraceptive management through policy reform, structured training, and multidisciplinary collaboration to improve reproductive health outcomes for women.

Keywords: oral contraceptives (OCs); emergency contraception (EC); pharmacists' role; contraceptive accessibility; reproductive health; South African women; contraceptive challenges

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Advancing ecopharmacovigilance in South Africa: a call to action for pharmaceutical stakeholders

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Abstract

Ecopharmacovigilance (EPV) represents an essential evolution of pharmacovigilance (PV), expanding the monitoring of pharmaceutical safety to environmental contexts. As pharmaceuticals enter ecosystems through anthropogenic activity, they persist as active pharmaco-environmental compounds (APECs), posing significant ecological and public health risks. Their contribution to the development and spread of antimicrobial resistance (AMR) is a growing global health threat. This article explores the connection between EPV and AMR, using the One Health approach to frame the interdependence of human, animal, and environmental health. It examines how insights derived from expanded monitoring of the pharmaceutical lifecycle can enhance strategies to mitigate contamination risks effectively. Healthcare facilities, community practices, and agriculture are key sources of antimicrobial waste. As antimicrobial waste continues to persist in wastewater, soil, and aquatic ecosystems, it exerts selective pressure on microbial populations, accelerating the spread of resistance traits through horizontal gene transfer. This environmental dimension of AMR reinforces the need for stewardship models that integrate healthcare policy, environmental science, and regulatory interventions. Pharmacists link antimicrobial stewardship (AMS) with EPV by guiding responsible medicine use and disposal. Integrating EPV into national and global AMR strategies is essential for reducing pharmaceutical pollution, strengthening environmental surveillance, and fostering more sustainable healthcare systems.

Keywords: ecopharmacovigilance, pharmaceutical safety, environmental contexts

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The pharmacovigilance of complementary medicines: unpacking the complexities

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Abstract

Complementary medicines in South Africa are defined as substances originating from natural sources such as plants, fungi, and minerals, intended to support physical or mental well-being. Unlike allopathic medicines, which are pure chemical compounds requiring registration through rigorous safety and efficacy dossiers, complementary medicines can be registered without such evidence. While allopathic medicines are backed by clinical trials, complementary medicines, especially herbal products, often lack robust clinical data. This disparity highlights the importance of pharmacovigilance (PV) to monitor adverse reactions (ADRs) and potential interactions in complementary medicines.

Complementary herbal medicines (Category D) fall within the regulatory ambit of the South African Health Products Regulatory Authority (SAHPRA), under the Medicines and Related Substances Act 101 of 1965. These products, however, are challenging to regulate due to variability in constituency, batch-to-batch inconsistencies, and a lack of clinical trial evidence. Herbal medicines, composed of multiple active compounds, are particularly complex, with potential synergistic or antagonistic interactions with conventional medicines complicating their safety profiles. Despite their widespread use, adverse drug reactions (ADRs) from herbal products remain undetected and underreported, often due to a lack of standardisation, insufficient clinical studies, and health illiteracy among consumers.

This paper proposes a methodology for investigating ADRs from complementary medicines, including understanding the formulation, clinical presentation, and phytochemical composition. By improving pharmacovigilance practices and fostering greater collaboration among experts, a more comprehensive safety profile for herbal-based medicines can be developed, ultimately benefiting public health.

Keywords: complementary medicines, pharmacovigilance, regulatory

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Acute complications of diabetes mellitus: current insights into pathophysiology and clinical management

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Abstract

Diabetes mellitus is a chronic metabolic disorder with rising global prevalence and significant morbidity and mortality due to its complications. Among these, acute complications such as diabetic ketoacidosis (DKA), hyperosmolar hyperglycaemic state (HHS), hypoglycaemia, and lactic acidosis represent urgent and life-threatening conditions requiring immediate medical intervention. DKA and HHS share common pathophysiological pathways involving insulin deficiency and counter-regulatory hormone excess, leading to profound metabolic disturbances. Although DKA is more common in type 1 diabetes (T1D) and HHS in type 2 diabetes (T2D), both demand prompt diagnosis and structured therapeutic strategies to restore fluid and electrolyte balance and normalise blood glucose levels. Hypoglycaemia is often due to drug-induced insulin overdosing, and is associated with neuroglycopenic symptoms, while lactic acidosis involves derangements in lactate metabolism and may be triggered by conditions such as sepsis or metformin use. This review explores the pathophysiology, clinical presentation, diagnostic features, and management protocols for these acute complications. It further highlights the importance of preventive strategies, patient education, and the potential role of digital health and personalised medicine in reducing the risk of complications and improving diabetes outcomes.

Keywords: diabetes; diabetic ketoacidosis; hyperosmolar hyperglycaemic state; lactic acidosis; hypoglycaemia

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Summoning the Sandman: Mitigating the rebound effects of hypnotic therapy

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Abstract

Insomnia significantly impairs quality of life, productivity, and mental health. Pharmacotherapy, such as benzodiazepines and Z-drugs, are often used, though notable risks include tolerance, dependence, withdrawal, and rebound insomnia, especially when used beyond short-term recommendations. This review summarises the pharmacological mechanisms and potential adverse effects, and further discusses the deprescribing strategies to reduce the occurrence of rebound and withdrawal effects. These include gradual dose tapering, substitution with longer-acting agents, adjunct use of melatonin, and integration of cognitive behavioural therapy for insomnia to support withdrawal and relapse prevention. Non-pharmacological approaches should be prioritised wherever feasible, and pharmacotherapy should be used judiciously, with patient education and interprofessional support. Ultimately, a balanced, individualised management plan that emphasises resolving the underlying reasons for insomnia, and incorporating judiscious use of non-pharmacological and pharmacotherapeutic options, should be aimed for.

Keywords: benzodiazepines, deprescribing, hypnotics, insomnia, rebound insomnia, withdrawal, Z-drugs

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A review of hyperhidrosis: pathophysiology, clinical management, and emerging therapies

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Abstract

Hyperhidrosis is a chronic disorder characterised by excessive sweating beyond the physiological needs of thermoregulation, significantly affecting patients' quality of life. This review explores the epidemiology, pathophysiology, and classification of hyperhidrosis, distinguishing between primary focal hyperhidrosis and secondary generalised hyperhidrosis. Current treatment strategies, including topical agents, systemic medications, botulinum toxin injections, iontophoresis, and surgical interventions, are discussed. Emerging therapies, such as microwave thermolysis, laser treatments, and novel pharmacological agents, are evaluated for their efficacy and safety. Advances in understanding the neural regulation of sweat glands and the impact of hyperhidrosis on mental health have opened new avenues for personalised and minimally invasive treatments. Despite the progress, challenges remain in diagnosis, treatment accessibility, and long-term management. This article highlights the importance of multidisciplinary care and future research to improve therapeutic outcomes for individuals with hyperhidrosis.

Keywords: hyperhidrosis, focal, secondary generalised

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An evaluation of knowledge, attitude, and behaviour amongst patients regarding antibiotic use and misuse in an urban setting within South Africa

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Abstract

Background: Antibiotic misuse is a major driver of antimicrobial resistance (AMR), a global health threat intensified by limited public awareness and inappropriate community practices. In South Africa, where the burden of infectious diseases remains high, understanding patients' knowledge, attitudes, and behaviours is essential for informing locally relevant education and stewardship strategies.

Methods: A descriptive cross-sectional study was conducted using a structured, self-administered questionnaire among 135 adult patients attending a community pharmacy in the eThekwini Metropolitan Municipality. Data were analysed using Microsoft Excel and SPSS to generate descriptive statistics and assess associations between socio-demographic variables and antibiotic-related knowledge, attitudes, and behaviours.

Results: While 80% of participants correctly acknowledged that different antibiotics are used for different infections, 73% mistakenly believed antibiotics are effective against viral illnesses. Only 61% recognised antimicrobial resistance as a global concern. Although 77% reported receiving antibiotic counselling from pharmacists and 72% from doctors, misconceptions about appropriate antibiotic use persisted. No statistically significant associations were found between gender, education level, or recent antibiotic use and knowledge or attitudes.

Conclusion: Communication between healthcare providers and patients is occurring; however, significant gaps in public knowledge persist, particularly regarding the inappropriate use of antibiotics for viral infections. To address these misconceptions and reduce antimicrobial resistance, context-specific educational interventions and strengthened provider–patient communication strategies are essential within both public and private healthcare settings in South Africa.

Keywords: antibiotic misuse, antimicrobial resistance, self-medication, knowledge, attitude, behaviour, South Africa

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Introduction

Antibiotics remain among the most widely prescribed and used medications globally due to their essential role in managing bacterial infections.[1] These agents act either as bactericidal by destroying bacteria, or bacteriostatic by suppressing bacterial growth and function synergistically with the host immune system to eliminate infectious pathogens.[2] However, the inappropriate and excessive use of antibiotics has accelerated the development and spread of antimicrobial resistance (AMR), which now poses a serious global health threat, contributing to increased treatment failure, prolonged illness, and rising healthcare costs.[1,3]

The World Health Organization (WHO) recognises AMR as one of the top ten global public health threats.[4] Misuse and overuse of antibiotics within communities including the use of antibiotics without prescriptions, poor adherence to treatment regimens, and using antibiotics for viral infections like the common cold and influenza are among the primary drivers of AMR.[5,6] Public knowledge, attitudes, and behaviours significantly influence these practices.

South Africa (SA) faces a complex and unique set of healthcare challenges that heighten the risk of AMR. The country's quadruple burden of disease comprising HIV/AIDS, tuberculosis, non-communicable diseases, and injuries places sustained pressure on its public and private healthcare sectors.[7,8] Inadequate regulation, over-the-counter access to antibiotics in some settings, and inconsistent public health messaging further contribute to inappropriate use.[9] Additionally, variations in healthcare access, urban and rural service delivery gaps, and varying levels of education and health literacy affect how patients understand, access, and use antibiotics.[10]

International studies, including those from Saudi Arabia and Southeast Asia, have shown that antibiotic misuse is shaped by cultural beliefs, health-seeking behaviours, and perceived accessibility of medical care.[11,12] Similar trends have been reported in SA, where patient pressure, cost concerns, and variable pharmacy counselling influence prescribing and consumption behaviours.[10] Moreover, household practices such as storing leftover antibiotics, sharing them among family members, or using them without professional consultation remain widespread, further exacerbating the risk of resistance.[13,14]

Understanding how patients interact with antibiotics at the community level is essential for developing contextually relevant educational and behavioural interventions. While international

studies have explored these issues in high-income countries, there remains a scarcity of research focusing on antibiotic-related knowledge, attitudes, and behaviours among South African patients, particularly within urban community pharmacy settings. This study aims to address that gap by examining these factors within a community pharmacy in the eThekwini Metropolitan Municipality, SA.

Aim

To evaluate the knowledge, attitudes, and behaviours of patients regarding the use and misuse of antibiotics in a community pharmacy setting in the eThekwini Metropolitan Municipality, South Africa.

Objectives

1. To assess patients' knowledge and attitudes toward antibiotic use and misuse.
2. To explore patient behaviours and perceptions related to antibiotic adherence, self-medication, and communication with healthcare providers.

Method

Study location

The eThekwini Metropolitan Municipality population was estimated at approximately 4.2 million in 2022, underscoring the public health relevance of the setting for evaluating antibiotic use, attitudes, and behaviours among community members.[15] The study was conducted at an independently owned community pharmacy located within a Mall in the Phoenix suburb, which is a densely populated area within the eThekwini Metropolitan Municipality. The pharmacy serves a socio-economically diverse population and provides daily access to essential primary healthcare services. During the study period, a total of 135 patients consented to participate in the survey.

Study population and sampling

The study population included adult male and female patients who were prescribed antibiotics and accessed the pharmacy during the one-month data collection period. Inclusion criteria were patients aged between 21 and 65 years, who were able to provide informed consent, and currently prescribed antibiotics. Patients younger than 21 were excluded to ensure independent decision-making capacity and comprehension, while those over 65 were excluded to limit recall bias and age-related cognitive variation. A convenience sampling method was employed; eligible participants present in the dispensary area during operational hours were invited to participate by the principal investigator.

Sample size

The sample size was determined using the Leslie Kish's formula, $n = Z2pq/d2$, where; n = desired sample size population < 10 000; Z = standard normal deviate set at 1, 96 at 95% confidence level and $d = 0.05$. This yielded a minimum required sample size of 135 participants, accounting for the small population size typically serviced by a single pharmacy.[16]

Study design

A quantitative, descriptive cross-sectional study was conducted to assess patients' knowledge, attitudes, and behaviours regarding antibiotic use and misuse within a community pharmacy setting in South Africa.

Instrument development and validation

Data were collected using a self-administered, semi-structured questionnaire adapted from validated instruments used in Kuwait, Sweden, and the United Kingdom.[17–19] The questionnaire was pilot-tested with 15 participants from the same community to assess clarity, language appropriateness, and cultural relevance. Based on feedback, minor modifications were made to align with local terminology, healthcare access experiences, and common medication examples. The final version was administered in English, the primary language of communication in the region. Internal consistency was assessed using Cronbach's alpha, with a threshold of ≥ 0.70 considered acceptable for reliability.[20]

The instrument consisted of four sections:

- Section 1: Demographic information (10 items)
- Section 2: Knowledge of antibiotic use (13 items)
- Section 3: Attitudes toward antibiotics (7 items)
- Section 4: Perceptions of doctor–patient communication (5 items)

Sections 2 through 4 used a five-point Likert scale (Strongly Disagree to Strongly Agree).

Data collection procedure

Data collection took place over four weeks following ethics approval. Participants who met the inclusion criteria were approached in the pharmacy and invited to complete the anonymous questionnaire after providing written informed consent. All responses were completed on-site and returned directly to the principal investigator to minimise loss or contamination of data.

Data analysis

Completed questionnaires were coded and entered the Microsoft Excel and analysed using SPSS Version 23. Descriptive statistics, including frequencies and percentages, were used to summarise demographic and survey data. Cronbach's alpha was calculated to assess internal consistency of the questionnaire domains. Associations between key variables were analysed using chi-square tests, and multivariate analysis of variance (MANOVA) was applied to explore correlations between knowledge, attitudes, and behaviours.

Ethics considerations

Ethics approval for the study was obtained from the Biomedical Research Ethics Committee at the University of KwaZulu-Natal

(Reference: BE061/19). Written informed consent was obtained from the study site and all participants prior to data collection. Permission to conduct the study at the site was granted by the pharmacy owner and responsible pharmacist. Site and participant confidentiality and anonymity were maintained throughout the study, in accordance with the Declaration of Helsinki.[21]

Table I: Sociodemographic characteristics of respondents (*n* = 135)

Characteristics	Category	*n* (%)
Gender	Male	63 (46.7)
	Female	72 (53.3)
Age	21–29	32 (23.7)
	30–39	52 (38.5)
	40–49	31 (22.9)
	50–59	16 (11.9)
	≥ 60	4 (3.0)
Antibiotic use in past 6 months	Yes	78 (57.8)
	No	57 (42.2)
Do you work or study in the medical field?	Yes	31 (23)
	No	104 (77)
Educational Qualifications	Matric	54 (40)
	Certificate	23 (17)
	Diploma	15 (11.1)
	Degree	24 (17.8)
	Masters	5 (3.7)
	Doctorate	4 (3.0)
	Other	10 (7.4)

Note: *n* = frequency (number of respondents) and % = percentage

Results

A total of 135 questionnaires were distributed with a 100% response rate. The Cronbach's Alpha test was used to measure the reliability of the items through internal consistency. The Cronbach's alpha coefficient was 0.752, indicating acceptable internal consistency for the questionnaire items in this sample. Table I provides information on the demographic characteristics of respondents.

Over half of the study respondents (*n* = 72; 53.3%) were females. The majority of the respondents (*n* = 52; 38.5%) were between 30 and 39 years old. More than half of the study population (*n* = 78; 57.8%) had used antibiotics in the past six months. The largest proportion of respondents (*n* = 54; 40%) reported high school (matric) as their highest educational qualification, while the remainder had post-secondary or tertiary education. However, a small portion (*n* = 31; 23%) worked or studied in the healthcare environment. Table II depicts the results of the respondent's knowledge of antibiotics and their use.

The majority of the respondents (*n* = 108; 80%) stated that different antibiotics are needed to "cure" different diseases. Most of the sample (*n* = 108; 80%) knew that antibiotics are effective against bacteria. Approximately two-thirds of respondents believed that antibiotics accelerate recovery from coughs and colds (*n* = 87; 64%) and are effective for most coughs and colds (*n* = 80; 59%). Over two-thirds (*n* = 98; 73%) incorrectly stated that antibiotics are effective against viral infections. Furthermore, the majority (*n* = 113; 84% and *n* = 108; 80%, respectively) agreed that antibiotic treatment should be discontinued if side-effects or skin reactions occur. Table III presents the results of the respondent's attitude towards antibiotic use.

Table II: Analysis of respondents' knowledge on antibiotics use

Statements	Strongly Disagree *n* (%)	Disagree *n* (%)	Neutral *n* (%)	Agree *n*(%)	Strongly Agree *n* (%)	Total *n* (%)
Different antibiotics are needed to cure different diseases	4 (3)	4 (3)	19 (14)	65 (48)	43 (32)	135 (100)
Antibiotics are effective against bacteria	7 (5)	5 (4)	15 (11)	63 (47)	45 (33)	135 (100)
Antibiotics can kill bacteria that normally lives on the skin and gut	2 (2)	7 (5)	17 (13)	67 (50)	42 (30)	135 (100)
Antibiotics speed up the recovery from coughs and colds	14 (10)	17 (13)	17 (13)	57 (42)	30 (22)	135 (100)
Antibiotics work on most coughs and colds	16 (12)	20 (15)	19 (14)	54 (40)	26 (19)	135 (100)
Antibiotics are effective against viruses	15 (11)	8 (6)	14 (10)	60 (45)	38 (28)	135 (100)
If you get side-effects during a course of antibiotics, you should stop taking it	9 (6)	7 (5)	6(4)	60 (45)	53 (40)	135 (100)
If you get a skin reaction when using antibiotics, you should not use antibiotics again	2 (2)	12 (9)	13 (10)	59 (44)	49 (36)	135 (100)
Antibiotics can cause an imbalance in the body's own bacterial flora	4 (3)	7 (5)	32 (24)	49 (36)	43 (32)	135 (100)
The unnecessary use of antibiotics can increase the resistance of bacteria to them	6 (4)	7 (5)	23 (18)	54 (40)	45 (33)	135 (100)
Antibiotics resistance is a worldwide problem	9 (6)	11 (8)	33 (25)	46 (34)	36 (27)	135 (100)
Antibiotics use among animals can reduce the effects of antibiotics among humans	21 (16)	34 (25)	31 (23)	29 (21)	20 (15)	135 (100)
Humans can be resistant to antibiotics	6 (4)	12 (9)	20 (15)	49 (37)	48 (35)	135 (100)

Note: *n* = frequency (number of respondents) and % = percentage

Table III: Analysis of respondents' attitude towards antibiotic use

Statements	Strongly Disagree *n* (%)	Disagree *n* (%)	Neutral *n* (%)	Agree *n* (%)	Strongly Agree *n* (%)	Total *n* (%)
I always complete the course of treatment with antibiotics even if I feel better	1 (1)	5 (4)	15 (11)	56 (41)	58 (43)	135 (100)
It is good to be able to get antibiotics from relatives or friends without having to see a doctor	64 (49)	37 (27)	6 (4)	22 (16)	6 (4)	135 (100)
I prefer to keep antibiotics at home in case there may be a need for it later	39 (30)	41 (31)	12 (8)	24 (17)	19 (14)	135 (100)
If I feel better, I sometimes stop taking my antibiotics before completing the course of treatment	44 (33)	36 (27)	11 (8)	54 (25)	10 (7)	135 (100)
I prefer to use antibiotics if I have a cough for more than a week	25 (18)	29 (21)	29 (21)	32 (26)	20 (14)	135 (100)
When I have a sore throat, I prefer to use antibiotics	30 (22)	44 (33)	21 (15)	28 (21)	12 (9)	135 (100)

Note: *n* = frequency (number of respondents) and % = percentage

Table IV: Analysis of perception on doctors habits and health professional/patient relationship

Statements	Strongly Disagree *n* (%)	Disagree *n* (%)	Neutral *n* (%)	Agree *n* (%)	Strongly Agree *n* (%)	Total *n* (%)
Pharmacists often tell you how to use antibiotics	3 (2)	11 (8)	17 (13)	51 (38)	53 (39)	135 (100)
Doctors often take time to inform patients during consultation how to use antibiotics	4 (3)	8 (6)	26 (19)	55 (41)	42 (31)	135 (100)
I trust the doctor's decision if they decide not to prescribe antibiotics	5 (4)	8 (6)	15 (11)	65 (48)	42 (31)	135 (100)
Doctors often prescribe antibiotics because the patient expects it	3 (2)	3 (2)	19 (14)	66 (49)	44 (33)	135 (100)
Doctors often take time to carefully consider the need for antibiotics	10 (7)	7 (5)	24 (18)	56 (42)	38 (28)	135 (100)

Note: *n* = frequency (number of respondents) and % = percentage

A large percentage of the respondents (n = 114; 84%) admitted to always completing the course of treatment with antibiotics, even if they felt better. The majority (n = 101; 74%) disagreed that it is good to get antibiotics from family or friends without having to see a doctor. About one-quarter of respondents (n = 31; 23%) reported that they sometimes discontinue antibiotics before completing the prescribed course, if they feel better. Table IV outlines responses concerning the perceptions of healthcare professionals' habits and health professional/patient relationships.

The vast majority of the sample population (n = 104; 77%) agreed that the pharmacists often tell them how to use their antibiotics during the dispensing process. Similarly, 72% (n = 97) agreed that doctors usually take time during consultations to explain how prescribed antibiotics should be used but this number is slightly lower when compared to the pharmacists. The majority of respondents (n = 107; 79%) stated that they trusted the doctor's decision not to prescribe antibiotics though many (n = 110; 82%) also believed that doctors often prescribed antibiotics because the patient expects it.

In order to assess whether the socio-demographic factors have an impact on antibiotic use, Pearson's Chi-Square test of independence was performed to identify the association between two variables: age, gender, education, antibiotic use in the past six months, and job status and antibiotic use. The Phi and Cramer's V depicts the test of the association level between the variables. Overall, based on the Pearson's chi-square test results, apart from gender (p = 0.364), all other socio-demographic variables are associated with using antibiotics as the p-values were less than 0.05. Table V presents the results of multivariate analysis of variance.

A multivariate logistics regression was used to determine the relationship between socio-demographic variables and knowledge, attitude, and behaviour of patients regarding antibiotic use. The reference groups were chosen based on the group to which the researcher wanted to compare all other groups within the same category, thus interpretation of the results much easier. The males were less likely to have good knowledge, attitude, and behaviour on antibiotic usage than the females. It can be seen in Table V that none of the variables (p = 0.051, 0.118 and 0.068 respectively) are statistically significant, as the p = values are greater than the significance value 0.05.

The knowledge and behavioural aspects across all age groups presented p = 0.000 (p-values are less than 0.05). When considering the attitude component, age group 21–29 years scored p = 0.005, age group 30–39 years scored p = 0.003, age group 40–49 years and 50–59 years scored p = 0.037. Therefore, the respondents aged 21–29, 30–39, 40–49, and 50–59 years old were likely to have good knowledge, attitude, and behaviour of antibiotic usage. The

Table V: Summary of multivariate analysis of variance (MANOVA)

Factor	Category	Knowledge		Attitude		Behavior	
Gender		*P*-Value					
	Male	0.051		0.118		0.068	
	Female	Reference Group					
	Overall	Chi-Square	Sig. Value	Chi-Square	Sig. Value	Chi-Square	Sig. Value
		3.020	.554	2.355	.671	1.520	.823
Age		*P*-Value					
	21–29	0.000		0.005		0.000	
	30–39	0.000		0.003		0.000	
	40–49	0.000		0.037		0.000	
	50–59	0.000		0.037		0.000	
	> 60	Reference Group					
	Overall	Chi-Square	Sig. Value	Chi-Square	Sig. Value	Chi-Square	Sig. Value
		10.640	.223	7.031	.533	6917.09	.000
Employment status		*P*-Value					
	Unemployed	0.000		0.037		0.000	
	Employed	Reference Group					
	Overall	Chi-Square	Sig. Value	Chi-Square	Sig. Value	Chi-Square	Sig. Value
		3.067	0.547	4.319	0.365	2.149	0.708
Educational Qualifications		*P*-Value					
	Matric	Reference Group					
	Certificate	0.565		0.560		0.974	
	Diploma	0.599		0.634		0.978	
	Degree	0.565		0.587		0.327	
	Masters	0.678		0.712		0.097	
	Doctor	0.713		0.761		0.097	
	Other	0.634		0.677		0.097	
		Reference Group					
	Overall	Chi-Square	Sig. Value	Chi-Square	Sig. Value	Chi-Square	Sig. Value
		18.104	0.947	13.422	0.859	14.104	0.825
Antibiotic usage in past 6 months		*P*-Value					
	Yes	0.288		0.069		0.758	
	No	Reference Group					
	Overall	Chi-Square	Sig. Value	Chi-Square	Sig. Value	Chi-Square	Sig. Value
		1.581	0.812	1.679	0.795	1.147	0.887
Work in medical field		*P*-Value					
	Yes	0.002		0.005		0.034	
	No	Reference Group					
	Overall	Chi-Square	Sig. Value	Chi-Square	Sig. Value	Chi-Square	Sig. Value
		4.093	0.394	3.713	0.446	1.071	0.899

associations were significant, which is different from the reference group.

Based on the survey responses (Table V), both groups of respondents that used or had not used antibiotics in the past six months differed in knowledge, attitude and behaviour regarding antibiotic usage, but these results are not statistically significant (knowledge $p = 0.288$, attitude $p = 0.069$ and behaviour $p = 0.758$).

Knowledge did not differ across all educational qualification groups towards antibiotic usage ($p > 0.05$). Furthermore, the respondents aged 21–29 years (14.8%), 30–39 years (17.8%), 40–49 years (12.6%) and 50–59 years (8.8%) were in disagreement with the use of antibiotics for a sore throat. Only 2.3% of respondents aged ≥ 60 years reported they would use antibiotics for a sore throat. The majority in younger age groups aged 21–29 years (16.3%), 30–39 years (21.5%), and 40–49 years (11.8%) agreed that antimicrobial resistance is a global problem.

Discussion

This study demonstrates that antibiotics remain frequently used in the community, with notable gaps in public knowledge, attitudes, and behaviours regarding their appropriate use. The knowledge component examined participants' understanding of antibiotics, their indications, potential side-effects, and the concept of AMR. While 80% of respondents correctly recognised that different antibiotics are required to treat various diseases, higher than the figure reported in Jordan (32.9%) but lower than in Kuwait (91.8%) and comparable to Malaysia (76.7%) where misconceptions persisted in key areas.[17,22,23]

A substantial proportion (73%) of participants believed antibiotics are effective against viruses, consistent with findings from Kuwait and Malaysia.[17,23] Misunderstandings were also evident about respiratory infections: 64% believed antibiotics speed recovery from coughs and colds, and 59% thought they were effective for most such cases which is lower than the proportions reported in Kuwait and Jordan.[17,22] These misconceptions mirror patterns observed in Namibia, where antibiotics were preferred for common cold symptoms such as sore throat and cough.[24]

The persistence of such beliefs reflects a lack of awareness that antibiotics have no therapeutic effect against viral infections, such as the common cold or influenza, nor fungal pathogens. Viruses differ fundamentally from bacteria in structure and replication mechanisms, rendering antibiotics ineffective. Inappropriate antibiotic use in viral infections not only fails to improve symptoms but also increases the risk of side-effects, elevates healthcare costs, and contributes to the emergence of resistant bacterial strains.[14]

Although 61% of respondents identified AMR as a global health concern, the prevalence of correct knowledge was still lower than in Kuwait and Malaysia.[17,23] This aligns with evidence that awareness of resistance does not necessarily translate into rational antibiotic use, as self-medication and misuse persist.

The attitude component assessed participants' predisposition towards antibiotic use. A considerable proportion reported willingness to use antibiotics for prolonged cough (39%) or sore throat (30%), and one-third (33%) indicated they sometimes stopped treatment early if they felt better; a pattern similar to that in Kuwait.[17] While 84% stated they always completed the prescribed course, the discrepancy between stated adherence and the proportion who admitted early cessation suggests that misconceptions about the duration of therapy remain. Premature discontinuation increases the risk of relapse, promotes resistance, and may lead to more severe or prolonged illness, increased medical costs, and, in severe cases, mortality.

Behaviourally, 31.8% of respondents reported keeping leftover antibiotics for future use which is lower than the 44.3% reported in Kuwait,[17] and 20.7% admitted obtaining antibiotics from family or friends without a prescription (like the 23.3% seen in Kuwait).[17] Such practices heighten risks of inappropriate drug choice, incorrect dosing, and delayed medical care, and may contribute to treatment failures and resistance development. Storing leftover antibiotics also poses safety hazards, particularly for children, and may result in the use of degraded or expired medications.[17,22,24]

Information sources emerged as an important behavioural determinant: a higher proportion of respondents reported receiving counselling on antibiotic use from pharmacists compared to doctors. This highlights the crucial role of both professions in public education and opportunities to enhance community-level antibiotic stewardship through improved communication during prescriber-patient consultations and dispensing of antibiotics.

Study limitations

This study employed convenience sampling from a single healthcare facility in one province of South Africa, which may limit the generalisability of the findings to the broader national population. The sample may not fully capture variations in antibiotic use behaviours across different cultural, socio-economic, or regional contexts. Future research should consider multi-centre sampling across diverse geographic areas to enhance representativeness and account for contextual differences.

Recommendation

This study emphasises the need for public education to dispel misconceptions about antibiotics, particularly their use for viral infections. Campaigns should address the risks of misuse, such as resistance and treatment failure. Strengthening healthcare provider and patient communication, restricting non-prescription sales, and implementing culturally tailored stewardship programmes are vital. Further provincial research should explore how socio-demographic factors shape antibiotic knowledge and attitudes.

Conclusion

This study in a South African community pharmacy highlights ongoing misconceptions about antibiotic use, especially regarding viral infections, as well as prevalent self-medication practices. Addressing these challenges requires consideration of socio-demographic and cultural factors, to inform targeted education. Enhancing communication between patients and healthcare providers, along with stricter antibiotic access controls, is essential to promote rational use and reduce resistance.

Conflicts of interest

The authors have declared that no competing interest exist.

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Ethical considerations

Ethics approval was sought from the Biomedical Research Ethics Committee at the University of KwaZulu-Natal (BE061/19).

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sapj

CPD questionnaire • November/December

Calming the acid: Pharmacotherapeutic approaches to gastro-oesophageal reflux disorder

1.	**A 45-year-old male presents with erosive oesophagitis confirmed by endoscopy. PPIs are selected as the first-line treatment. Which of the following is the most appropriate counselling advice regarding PPI administration?**
a	Take the PPI immediately after meals to maximise acid suppression
b	Administer the PPI at bedtime to reduce nocturnal acid production
c	Take the PPI 30 to 60 minutes before meals, preferably in the morning
d	Take the PPI only when symptoms occur for on-demand relief
e	Administer the PPI with an antacid to improve absorption
2.	**A community pharmacist notices a patient has been refilling omeprazole for over 12 months without follow-up. What is a prominent concern with long-term unsupervised PPI use?**
a	Reduced absorption of dietary fats
b	Development of tolerance to PPI therapy
c	Increased risk of nephrotoxicity
d	Increased risk of nutrient malabsorption
e	Complete suppression of gastric acid production
3.	**In South Africa, cimetidine remains the most commonly available H2-receptor antagonist. Which of the following adverse effects is uniquely associated with cimetidine and not observed with other H2-receptor antagonists?**
a	Diarrhoea and abdominal bloating
b	Gynaecomastia due to anti-androgenic effects
c	Headaches and dizziness
d	QT prolongation in high doses
e	Development of tolerance within two weeks
4.	**A 62-year-old patient wishes to discontinue long-term esomeprazole therapy. Which of the following is the *best deprescribing* strategy to minimise complications?**
a	Abrupt cessation
b	Gradually taper the dose
c	Switch to double-dose cimetidine therapy for rebound prevention
d	Replace with aluminium hydroxide alone for maintenance
e	Continue PPI due to risk of GORD recurrence
5.	**A patient presents with mild, intermittent reflux symptoms that occur only after heavy meals. Which of the following would be the most appropriate initial pharmacotherapeutic option?**
a	High-dose omeprazole therapy
b	Combined H2-receptor antagonist and pantoprazole
c	On-demand use of an alginate-antacid combination
d	Routine H2-receptor antagonist therapy
e	Morning-only double-dose esomeprazole

Pharmacological management of bacterial conjunctivitis in South Africa

6.	**Which of the following factors makes children particularly susceptible to bacterial conjunctivitis in South Africa?**
a	Lower rates of vaccine uptake compared to adults
b	Close contact during play and upper respiratory tract infections
c	Increased exposure to occupational hazards
d	Higher frequency of allergic responses
7.	**Which bacterial species is the second most common cause of bacterial conjunctivitis and is often spread through direct contact with secretions or contaminated surfaces?**
a	Haemophilus influenzae
b	Streptococcus pneumoniae
c	Staphylococcus aureus
d	Pseudomonas aeruginosa
8.	**Why are topical antibiotics generally preferred over oral antibiotics for bacterial conjunctivitis in South Africa?**
a	They are cheaper and more widely available
b	They provide a localised effect with reduced systemic side-effects
c	They prevent viral and allergic conjunctivitis
d	They require fewer doses compared to oral therapy
9.	**Which of the following practices contributes most significantly to antimicrobial resistance in bacterial conjunctivitis management in South Africa?**
a	Using lubricating eye drops for mild conjunctivitis
b	Reserving oral antibiotics for severe or neonatal cases
c	Over-the-counter availability and misuse of topical antibiotics
d	Relying on microbiological testing before prescribing antibiotics

Summoning the Sandman: Mitigating the rebound effects of hypnotic therapy	
10.	**Which approach would not be considered appropriate when a patient experiencing insomnia is ending their cycle of Z-drug treatment?**
a	Gradual Z-drug tapering over several weeks
b	Combined Z-drug tapering with parallel cognitive behavioural therapy support
c	Drug replacement with short-acting benzodiazepines
d	Adjunct therapy with melatonin administration
11.	**A 45-year-old male with acute situational insomnia due to job stress is prescribed medication for support. He has no psychiatric history and needs to resume work safely. Which agent is most appropriate for a short-term (≤ 2 weeks) prescription?**
a	Phenobarbitone
b	Zolpidem
c	Diazepam
d	Diphenhydramine
12.	**Increased mortality has been associated with benzodiazepines in elderly individuals for what reason?**
a	Greater potential for falls and fracture
b	Excessive CNS depression
c	Increased hepatic clearance
d	Drug-drug interaction burden

The pill and the profession: The role of pharmacists in oral contraceptive access for evolving women in South Africa	
13.	**Which of the following best describes the role of pharmacists in contraceptive management in South Africa?**
a	Pharmacists may only dispense oral contraceptives on a doctor's written instruction
b	Pharmacists are strategically positioned to provide both dispensing and counselling services in contraceptive care and may initiate oral contraceptive if authorised under Section 22A (15) permit
c	Pharmacists are not permitted to discuss emergency contraception with patients
d	Pharmacists may initiate oral contraceptives without any patient interview or record-keeping
14.	**According to the article, which of the following statements is TRUE regarding emergency contraception (EC) in South Africa?**
a	EC requires a prescription from a doctor
b	EC is illegal for adolescents under the age of 18
c	Certain EC is legally available for non-prescription access in community pharmacies
d	EC may only be dispensed in public sector clinics
15.	**According to the article, why is a collaborative care approach between pharmacists and doctors important in contraceptive management?**
a	It reduces doctors' workload by transferring some responsibility to pharmacists
b	It ensures better patient follow-up, risk assessment, and continuity of reproductive health care
c	It allows pharmacists to prescribe without regulatory oversight
d	It prevents pharmacists from referring patients to other healthcare providers

The answers for these CPD questions will be in the upcoming issue of the SAPJ.
This activity can contribute towards your CPD compliance.

CPD answers • September/October 2025

1. c 2. a 3. d 4. b 5. c 6. a 7. c 8. b 9. d 10. b 11. a 12. c
13. b 14. b 15. a 16. a 17. b 18. c 19. c 20. b 21. c

Forum

SA Association of Hospital and Institutional Pharmacists

Expanding career horizons for pharmacists: policy, regulation, industry and public health

Rashmi Gosai

Chairperson: SAAHIP Southern Gauteng Branch

Introduction

The pharmacy profession is undergoing a dynamic transformation—both in South Africa and globally. Pharmacists are no longer confined to traditional dispensing roles; they are emerging as influential contributors to health policy, regulatory science, quality assurance, market access, medical affairs, public health, and entrepreneurship. These evolving roles are expanding career opportunities while strengthening healthcare systems and advancing patient safety.

With extensive experience across most sectors of pharmacy, I've seen how pharmacists can drive meaningful change beyond the dispensary. As Chairperson of the Southern Gauteng Branch of the South African Association of Hospital and Institutional Pharmacists (SAAHIP), I have also witnessed how professional bodies empower pharmacists to lead, advocate, and shape the future of our profession.

Pharmaceutical and health policy

Pharmaceutical policy governs medicine accessibility, affordability, and rational use. Pharmacists contribute through technical input, formulary decisions, and advocacy for equitable access. In South Africa, platforms such as the National Essential Medicines List Committee (NEMLC), the Pharmaceutical Society of South Africa (PSSA), and SAAHIP enable pharmacists to influence national health priorities.

SAAHIP plays a pivotal role in representing pharmacists in hospitals and institutional settings. Through its branches and national structures, it fosters professional development, policy engagement, and collaboration. Globally, the World Health Organization (WHO) recognises pharmacists as key stakeholders in universal health coverage, antimicrobial stewardship, and immunisation strategies.

Regulatory affairs and pharmacovigilance

Regulatory affairs ensures that medicines and medical devices meet rigorous standards for safety, efficacy, and quality. Pharmacists play a key role in this space—contributing to product registration, inspections, and compliance both within pharmaceutical companies and at the regulatory authority, SAHPRA. Pharmacovigilance complements these efforts by monitoring adverse drug reactions, analysing safety data, and identifying risk signals to protect public health and ensure ongoing therapeutic safety.

Quality Assurance (QA)

Quality assurance underpins pharmaceutical manufacturing, distribution, and clinical research. Pharmacists in QA oversee batch release, manage deviations and corrective and preventative actions (CAPAs), and ensure compliance with cGxP such as Good Manufacturing Practice (GMP), Good Distribution Practice (GDP), Good Clinical Practice (GCP). These roles span local distributors to multinational companies and demand precision and a commitment to patient safety.

Market access and health economics

Market access ensures patients benefit from registered therapies. Pharmacists in this field work on pricing, reimbursement, and health technology assessments (HTAs). With National Health Insurance (NHI) on the horizon, pharmacists with expertise in Pharmacoeconomics will be vital in shaping sustainable healthcare financing.

Medical affairs

Medical affairs bridges science and clinical practice. Pharmacists act as therapeutic experts, supporting ethical promotion, clinical data dissemination, and training. Roles such as Medical Science Liaisons (MSLs) involve engaging with healthcare professionals, supporting investigator-initiated studies, and ensuring compliance with the Marketing Code of Practice.

Public health

Pharmacists are well-positioned for public health careers. Beyond dispensing, they contribute to antimicrobial stewardship, health promotion, immunisation programmes, and pharmacoeconomic evaluations. Opportunities exist within the Department of Health, NGOs, and international organisations such as the World Health Organization (WHO) and Global Fund.

Entrepreneurship

Entrepreneurship is an exciting frontier for pharmacists seeking to innovate in healthcare. With technical and regulatory expertise, pharmacists are well-placed to identify gaps in service delivery and compliance. Emerging ventures include:

- Pharmaceutical and medical device establishments
- Regulatory and QA consulting practices
- Digital health and wellness platforms

Having founded a medical device establishment myself, I have seen how pharmacists can integrate scientific knowledge with business strategy while maintaining regulatory compliance and driving innovation.

Postgraduate study opportunities

Postgraduate education empowers pharmacists to specialise and take on leadership roles across diverse sectors. South African universities offer programmes that align with the evolving needs of the pharmaceutical industry and public health. Below are some institutions which are offering advanced degrees that can accelerate your career and expand your professional impact:

- University of the Witwatersrand (Wits): Research-based Master of Pharmacy in pharmaceutics, pharmaceutical chemistry, and pharmacy practice.
- University of KwaZulu-Natal (UKZN): M. Pharm in Pharmacy Practice, focusing on Pharmacoeconomics and clinical pharmacy services.
- Sefako Makgatho Health Sciences University (SMU): Programmes in Clinical Pharmacy, Public Health Pharmacy and Management, and Pharmaceutical Sciences.
- North-West University (NWU): Master of Pharmacy in Pharmacy Practice, with admission based on academic and practical performance.
- University of the Western Cape (UWC) and University of Pretoria (UP): Advanced training in regulatory affairs, public health, and clinical pharmacy.

These programmes open doors to leadership roles in regulation, public health, and clinical practice—locally and internationally.

Conclusion

Pharmacy in South Africa is evolving beyond traditional boundaries. From shaping policy and regulation to driving innovation in industry and public health, pharmacists are redefining their professional identity. By embracing postgraduate education and exploring non-traditional career paths, pharmacists can become architects of healthcare transformation.

The future of pharmacy lies not only in dispensing medicines—but in influencing how they are developed, accessed, and governed. Through associations like SAAHIP, pharmacists can amplify their impact, advocate for systemic change, and lead the profession into a new era of relevance and innovation.

Forum

SA Association of Hospital and Institutional Pharmacists

Future-Ready Pharmaceutical Practice: AI-Driven Redistribution of Short-Dated Stock in South African Public Hospitals

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Based on the presentaton which was awarded the Life Healthcare Best Poster Award at the 37th Annual Conference of the South African Association of Hospital and Institutional Pharmacists (SAAHIP)

Abstract

Pharmaceutical waste due to expired medicines poses a critical challenge in South Africa's public healthcare system. This quality improvement project aimed to mitigate the risk of fruitless and wasteful expenditure associated with short-dated medicines (identified as stock with six months or less to expiry) through a pharmacist-led, artificial intelligence (AI) enhanced redistribution model. The initiative, implemented at Dr Pixley Ka Isaka Seme Memorial Hospital and later piloted for external redistribution, focused on three key interventions: ward-based audits, monthly redistribution efforts, and the conceptualisation of an AI-driven expiry and demand prediction platform. The result was a substantial reduction in potential stock losses, with R31 314.55 worth of medicines successfully redistributed internally and externally. The project aligns with national priorities on pharmaceutical accountability and has been proposed as a scalable model across other districts.

Introduction

The efficient use of pharmaceuticals within South Africa's public health sector is vital to ensuring sustainable healthcare delivery. One of the persistent issues facing hospital pharmacies is the accumulation of short-dated stock, defined as medicine with less than six months until expiry. These medicines, if not identified and redistributed timeously, contribute significantly to fruitless and wasteful expenditure which is an outcome explicitly cautioned against in Treasury Circular G77.[1]

This challenge is amplified by systemic inefficiencies, poor communication between departments, and the absence of real-time inventory visibility. Despite the existence of Standard Operating Procedures (SOPs) promoting the FEFO (First Expiry First Out) principle, these are often not consistently implemented across wards.[2,3] This project was conceptualised in direct response to the need for a sustainable, pharmacist-led model to identify, track, and redistribute short-dated stock, both within the hospital and externally to institutions.

Aim and Objectives

The aim of this project was to reduce avoidable pharmaceutical expenditure by improving the visibility and redistribution of short-dated medicines across six wards at a regional level hospital in KwaZulu-Natal, South Africa.

The objectives were:

- to evaluate the current practices of medicine supply and expiry management at ward level;
- to implement monthly Ward Organizational Checks (WOCs) for early identification of short-dated stock;
- to develop and implement a pharmacist-led redistribution system using internal and external networks;
- to conceptualise an artificial intelligence (AI) driven platform that automates expiry alerts, predicts demand, and facilitates real-time redistribution; and
- to quantify cost savings and assess operational feasibility for district-wide scale-up.

Methodology

This prospective, quality improvement project was implemented between July 2024 and February 2025 at Dr Pixley Ka Isaka Seme Memorial Hospital. The intervention was structured in three phases:

Phase 1: Ward-Level Expiry Audits

Monthly WOCs were conducted by pharmacist's assistants and nursing staff in six hospital wards: Medical ward 2, Surgical ward 2 and 3, Orthopaedic ward 1 and 3 and the Adult Intensive Care Unit. The audits focused on storage conditions, stock appearance, compliance with FEFO, and presence of expired or short-dated stock. Findings were logged in structured compliance tools aligned to existing SOPs.

Phase 2: Pharmacy Redistribution and Communication

Based on WOC data and RxSolution reports, a monthly short-dated stock list was compiled detailing medicine name, quantity, expiry date, and rand value. This list was shared via institutional platforms including email and WhatsApp to nearby facilities. A single pharmacist served as the contact person to handle responses, coordinate transfers, and update stock records.

Phase 3: AI System Conceptualisation

An AI model was simulated to demonstrate automated expiry alerts to be sent to procurement teams via email, intranet, and mobile apps, consumption forecasting, and redistribution routing. Employment of expiry tracking and demand prediction using AI algorithms to flag items expiring within 6 months and match to institutions with relevant demand. The use of AI forecasting for analysis of historical usage to recommend stock transfers and dynamic discounting and creation of an AI-Powered marketplace as a centralised platform enabling institutions to view and request short-dated medicines was presented.

The proposal of an integrated workflow with automated order generation, stock updates, and shelf-life monitoring and system conceptualised for scalability with mobile functionality, dashboard reporting, and integration with RxSolution was highlighted.

Results

The monthly WOCs led to significant improvements in expiry management across all six wards. In the first audit month (July 2024), expired stock worth R1 554.18 was removed and redistributed internally to higher-turnover areas. Compliance scores across wards improved by 35% over the six-month cycle, as measured by completed expiry logs and improved shelf organisation. Staff interviews indicated increased awareness of storage SOPs and collaboration with pharmacy personnel.[4]

Figure 1 depicts that the availability of a short-dated list of medicines in wards, available to pharmacy, is undoubtedly a successful effort to redistribute short-dated stock within the institution and prevent fruitless and wasteful expenditure resulting from expired stock in wards. A total of **R 1 554.18 was saved** through active and effective redistribution.

Pharmacy-led redistribution efforts yielded substantial savings. From July 2024 to February 2025, short-dated stock with a total value of R65 520.47 was identified and advertised. Of this, R28 853.80 was accepted by external facilities, and R2 460.75 was absorbed into high-demand wards within the hospital.

This method of reinforcing medicine supply management within the pharmacy successfully prevented the loss through expiry of **R31 314.55** worth of stock (48%), demonstrating significant cost savings from the total advert value of R65 520.47.

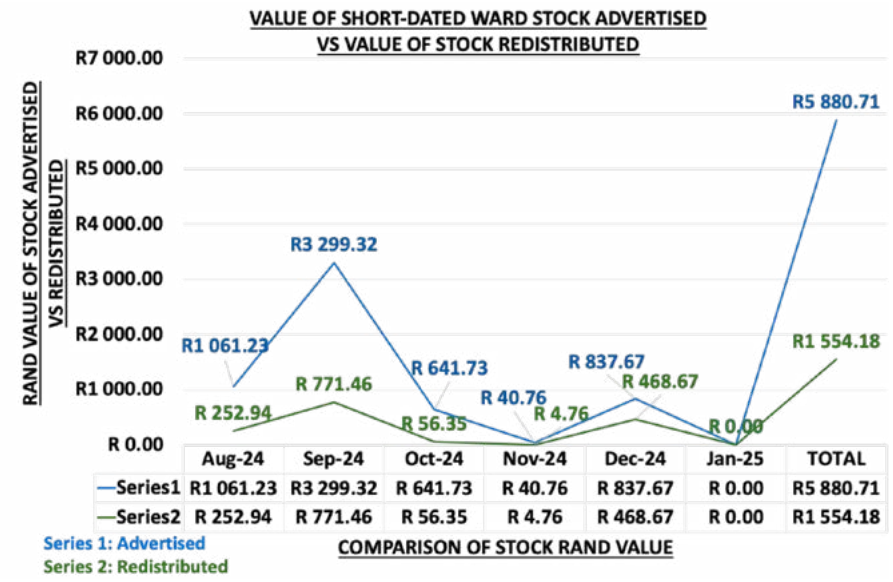

Figure 1. The Rand value of short-dated ward stock advertised per month in July 2024 against the Rand value of stock redistributed per month

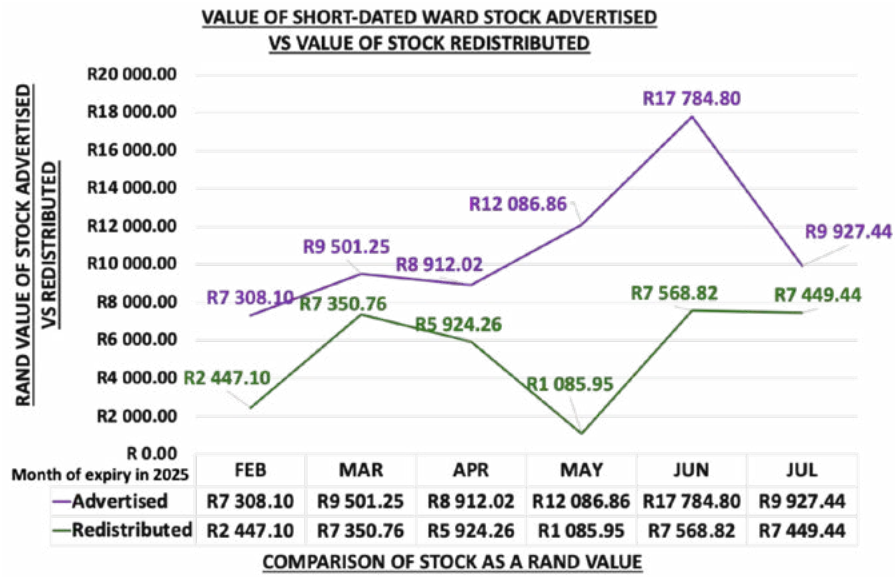

Figure 2. The Rand value of short-dated ward stock advertised per month in February 2025 against the Rand value of stock redistributed per month

The AI prototype demonstrated predictive functionality through mock expiry dashboards. Simulated outputs can generate alerts for soon-to-expire stock, map out high-consumption facilities based on historic RxSolution data and offer demand-based redistribution suggestions.

Discussion

This initiative illustrates the power of decentralised pharmacist-led interventions supported by modern technology.[5] Monthly WOCs provided the visibility necessary to track expiry trends in real time, allowing for timely redistribution. Importantly, the audit process strengthened nurse-pharmacist collaboration, leading to a culture of shared accountability.

Pharmacy redistribution, although resource-intensive, created a new workflow for medicine salvage. The use of platforms like WhatsApp and shared spreadsheets enabled low-cost, high-impact communication. Establishing a single point of contact ensured continuity and prevented fragmentation. However, transportation delays and reluctance from receiving hospitals to accept near-expiry stock remained challenges.

The AI component, though still in conceptual form, represents a future-ready tool that aligns with health system digitisation.[6] Its ability to integrate expiry alerts, usage forecasting, and redistribution pathways into a single platform could greatly reduce human error and administrative load. However, its success will depend on data accuracy, system interoperability, and change management among pharmacy personnel.[7]

Recommendations

Based on the project outcomes, the following recommendations were made:

- rolling out the WOC and redistribution model to other hospitals within the district; establishing a central stock-sharing communication channel between institutions;
- training pharmacists and pharmacist's assistants on pro-active expiry management;
- piloting the AI platform in one high-volume district before full-scale implementation; and
- developing electronic expiry logs for integration into RxSolution systems.

Conclusion

This quality improvement project successfully addressed the issue of short-dated medicine wastage through a pharmacist-led and simulated AI-supported model. The combined use of manual audits and redistribution not only prevented substantial financial losses but demonstrated the feasibility of scalable solutions in low-resource environments. The project's success highlights the critical role of pharmacists in safeguarding pharmaceutical resources and advancing health system resilience in South Africa.

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Substandard and falsified medical products

Mokgadi Daphne Fafudi

BPharm (Wits), PDip HPM(MEDUNSA), MSc Med Pharm Cum Laude (MEDUNSA), MBA(Wits)

Substandard and falsified medical products (SFMPs) are identified as one of the urgent global challenges of this decade. The global threat and routes to the market of SFMPs have grown exponentially with the ever-increasing demand for medical products globally. The entry of SFMPs into the supply chain undermines efforts made towards ensuring access to quality, safe and efficacious medical products. Africa and South Africa import a lot of medical products; subsequently, a significant percentage of SF medical products circulating globally are found in Africa, and this presents a serious concern for public health, affecting the attainment of Sustainable Development Goal (SDG) 3, which aims to have universal health access for all. A common finding from the WHO Global Benchmarking Tool assessments is the need for strengthening the market surveillance and control function, which fights the SFMPs.

In 2024, the World Health Organisation (WHO) selected South Africa as the first country to pilot its draft handbook on the National Action Plan against Substandard and Falsified medical products (NAP), for a one-year pilot. Following the success of the RSA pilot, the WHO handbook will subsequently be rolled out globally to Member States for implementation. The NAP is a collaborative effort with key stakeholders to develop strategies for Prevention, Detection, and Response to Substandard and Falsified Medical Products (SFs/SFMPs). This project is led through the South African Health Products Regulatory Authority (SAHPRA) and the National Department of Health (NDOH). The pilot in South Africa seeks to adapt, test, and implement the handbook's framework. This serves both the objectives of strengthening the national health system and contributing to the WHO's global learning agenda. The handbook mentions that it takes political commitment, resources, and sustained, coordinated action to combat SF medical products and restore or maintain trust in health systems. The handbook also aimed to support national responses and encourage regional and global coordination engagement to reduce the threat to patients and consumers everywhere. In November 2024, the sensitisation workshop was conducted with all stakeholders.

SAHPRA's annual report, published on its website (SAHPRA, 2024:53)[1], includes the number of product quality complaints reported that resulted in investigations. In 2021/2022, 130 related investigations were recorded, which more than doubled to 297 in 2022/2023, increased to 430 in 2023/2024 and increased to 507 in 2024/2025 (not yet published). Raids by SAHPRA and law enforcement agencies have confiscated numerous falsified products containing Glucagon-Like Peptide-1 (GLP-1) active components or a combination of Glucagon-Like Peptide-1 (GLP-1) and Gastric Inhibitory Polypeptide (GIP) agonists, which are claimed to be for weight loss, sexual enhancement (both male and female), skin-bleaching agents containing corticosteroids, anabolic steroids, headache sachets, etc. The aforementioned items are regulated under the Medicines Act and therefore require market authorisation.

SAHPRA, through its Regulatory Compliance Manager, Ms Fafudi, coordinated this initiative through an inclusive, collaborative process that involved a Steering Committee comprising key national stakeholders. The NAP Committee was established with four subcommittees: Education and Awareness, Enforcement, Infrastructure, and Supply Chain. Several meetings took place between February and August 2025.

The developed 5-year National Action Plan against SFs outlines a structured approach to address SF products in South Africa. As part of the NAP Committee's work, several presentations on its activities were made, including one at the WHO MSM meeting in Geneva (August 2025), the Permanent Forum on International Pharmaceutical Crime (PFIPC) in Vienna (September 2025), the WHO Regional Office for Africa (AFRO) meeting in Nairobi (June 2025), the African Working Group on SFs in Addis Ababa (July 2025) and the SADC SF Focal Points forum. In addition, presentations were made to the Parliamentary Portfolio Committee on Health, as well as during various NDoH/SAHPRA stakeholder workshops and multiple health and pharmaceutical industry conferences. On 30 September 2025, a significant milestone was achieved with the successful launch of Africa's first comprehensive National Action Plan, developed by the Committee.

Findings of the draft handbook pilot in the South African and general context:

- The document was sufficiently clear and accessible in terms of organisation, language and structure
- The document provided sufficient practical guidance in terms of what was needed to develop a national action plan
- The resources cited were sufficient to support the country in developing our national action plan

- The country implementing NAP will explore further components regarding Prevent, Detect and Respond strategies in the framework, as they are interlinked.
- Key considerations in assessing risk and prioritising national activities must be inclusive, factual, with a risk-based approach for practical implementation and investment justification
- The workplan templates and costing guidelines were helpful and tailored to our country's needs

Challenges that were identified include establishing formal Inter-Ministerial Committees (IMCs), as politicians are preoccupied with priorities at a macro level. The DGs in the department are accounting officers, equivalent to Chief Executive Officers, and thus, this structure was used for the IMC. The private sector responded swiftly to the establishment of the NAP, but the government's bureaucratic processes caused delays in responsiveness. Nonetheless, the development of the NAP was exceptionally embraced by focal point officials.

Focal points in both government and non-governmental sectors have been instrumental to the success of the project and the development of the NAP. Challenges also include departments prioritising their high-value areas when allocating human, financial, technological, and equipment resources. Therefore, when developing the operational plan, we needed to be practical in prioritising activities and roles. Generally, the country faces challenges such as tough economic conditions, including ongoing budget cuts, increased retrenchments and layoffs, and a high unemployment rate. The enforcement sector is overburdened, with a high volume of criminal cases to handle and a shortage of staff in relevant specialised units.

When developing and implementing a National Action Plan (NAP), it is important to consider the contextual factors and success conditions, including acknowledging that all participating stakeholders operate as independent entities. Their level of commitment is therefore influenced by their specific interests and the extent of their participation in the process. Sustaining active participation requires scheduling regular meetings at intervals agreed upon by the majority to retain traction and continuity. All stakeholders need to feel valued and recognised, and for their contributions to be incorporated into action. Another factor is leveraging personal and professional relationships with members to further enhance collaboration and responsiveness, particularly since formal invitations sent through official channels often experience delays, leading to missed opportunities for timely meetings and actions.

The active NAP stakeholders include, but are not limited to: the National Department of Health, SAHPRA, South African Revenue Service, Department of Justice, National Prosecuting Authority, Department of International Relations and Cooperation, Border Management Authority, Department of Trade, Industry and Competition, CIPC, COGTA Traditional Affairs, South African Police Services, Department of Agriculture, all Health/Pharmaceutical Provincial Departments, Cooperative Governance Traditional Affairs, South African National AIDS Council, Department of Social Development, Central Drug Authority, Head of Pharmaceutical Services (HOPS), Government and private entities, Pharmaceutical Society of South Africa (PSSA), South African Pharmacy Council, Health Professions Council of South Africa, academia, and captains of the health industry supply chain/business.

The 5-year NAP development process included: situation analysis, data and risk analysis, goal setting, stakeholder mapping, dialogue with key stakeholders, potential barrier identification, establishment of governance and coordination mechanisms, development of structures nationally, resource allocation to implement NAP, prioritised activities identified, resource mobilisation, implementation model developed, monitoring and evaluation, and the sustainability of NAP implementation.

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Health technology assessment is a process intended to standardise evaluation of health technologies and optimise resource utilisation to promote equitable access and improve health outcomes


Dr Ruth Lancaster


Ms Kim MacQuilkan


Dr Jane Riddin


Ms Nasreen Seedat


Ms Riona Sonne

Meet the team driving impact through strengthening health technology assessment processes through the evaluation of essential medicines in South Africa. With diverse expertise, shared passion and a commitment to excellence, this (incidentally) all-female team leads the coordination and oversight of the review of the national Standard Treatment Guidelines (STGs) and Essential Medicines List (EML) and implementation thereof, in the South African public health sector.

The Essential Drugs Programme (EDP) supporting the National Essential Medicine List Committee| (NEMLC) and the Expert Review Committee of NEMLC is a strong example of "**Think Health, Think Pharmacy – One Profession, Many Roles**" and highlights the diverse and critical functions of pharmacists in healthcare and their potential contributions towards the strategic goal of National Health Insurance and Universal Health Coverage. The team brings together a wealth of experience in clinical pharmacy, evidence-informed decision-making, clinical research, pharmacoepidemiology, health economics as well as reimbursement models.

Driven by a passion for enhancing healthcare access and patient outcomes, the EDP team use their considerable local, and international expertise, across private, public and nonprofit sectors, to shape solutions and strengthen systems towards healthcare transformation.

The collaboration is a testament to the capacity of women to lead strategic development and create substantial impact at all levels of care. At the juncture of Women's Month and Pharmacy Month, we are proud to shine the spotlight on this all-female team highlighting the impact of pharmacists in the South African healthcare system.

From L to R: Ms Olwethu Mambinja, Ms Amanda Brewer, Dr Millidhashni Reddy, Ms Khadija Jamaloodien, Dr Janine Jugathpal, Ms Zahiera Adam, Ms Maropeng Rapetsoa, Ms Derusha Frank

News

Pharmacy Month 2025: Edenvale Hospital Pharmacy

GAUTENG PROVINCE
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EDENVALE REGIONAL HOSPITAL

Edenvale Regional Hospital Pharmacy initiated a week-long campaign during Pharmacy Month in order to put the spotlight on the pharmacy profession and show our patients and staff our role in quality healthcare provision. We focused on the chosen theme for the year of "Think Health, Think Pharmacy - One Profession, Many Roles". This aligned with the International Pharmaceutical Federation (FIP) global campaign.

Fatema Mia, a pharmacist at the Edenvale Hospital Pharmacy, assisted in the planning of the campaign

We implemented a number of activities to cater to patients of all ages as well as show appreciation towards pharmacy personnel.

The following was implemented:

- Staff Training: Our team had amazing training sessions from various companies, helping us to grow professionally and keep abreast with the latest information available. Trainings were conducted by NBI, Sanofi, Novartis, and Fresenius. Refreshments and goodies for staff were also generously supplied.
- Healthy Treats for Patients: Every day, we handed out water and fresh fruit to our patients because as pharmacists we know that good health starts with small acts of care. We approached various companies to supply some water, snacks and paraphernalia for patients. We also received sponsorships from people in the community who are eager to give back to the community and show goodwill. This was greatly appreciated by the patients.
- An information table was set up on site for one of the days. This was generously sponsored by Angelique Scharneck from Cipla who joined us on-site, offering information, education, and even snacks and water for our patients.
- Colourful Dress-Up Days: For the spirit of pharmacy month, we had a dress code where a different colour was suggested for each day of the week. This added an element of fun and also showed our unity as a team. Friday's theme was cultural dress-up which tied in beautifully with our hospital's Heritage Day celebrations. An added highlight for our unit was that two of our staff members won "Best Dressed" across the entire hospital!
- Kiddies Corner: A kids' table was set up where our littlest visitors had their own fun space with snacks, colouring sheets and play dough which they really enjoyed.
- FIP World Pharmacists Day – 25 Sept: We closed the celebrations with a bang, dressing up in blue and white and gifting our entire team goodie bags packed with treats and surprises – a small token of appreciation for the amazing work they do every day. These were kindly donated by Maisha Medical, Aurogen, and Adcock Ingram. Bayer also generously sponsored a delicious lunch to say thank you to our dedicated team.

The pharmacy waiting area and counselling areas were brightly decorated with colourful balloons and posters

- The pharmacy was brightly decorated in colourful balloons and posters to highlight the celebration of Pharmacy Month.
- What a celebration! It was full of learning, fun, colour, and appreciation and it perfectly captured how pharmacy really is one profession with many important roles.

Edenvale Hospital Clinical Manager, Dr Hlomile Mlahleki (middle right), and Edenvale Hospital Pharmacy Manager, Mrs Rudzani Negondeni (middle left), together with the pharmacy team. The posters are displaying the various roles that pharmacists can hold

Obituary

Professor Robert Stanley Summers

30 March 1940 – 22 September 2025

A tribute to a remarkable academic and a life well lived

Robert Stanley Summers, an Emeritus Professor of Pharmacy at the Sefako Makgatho Health Sciences University, formerly the Medical University of Southern Africa (MEDUNSA) and known to all as 'Prof Rob Summers', died peacefully at his home on the morning of 22 September 2025. He is survived by his wife Prof Beverley Summers, his three sons Neil, Andrew and Matthew, his daughter, Kate, and five grandchildren, all of whom he adored.

Prof Summers matriculated in Zimbabwe and obtained his bachelor's and master's degrees in pharmacy at Rhodes University, Grahamstown, followed by his PhD from the University of Bradford. He was the Head of the School of Pharmacy at MEDUNSA, which he founded in 1983, for over 20 years. He was the Pharmacy Training and Development Project Manager, Chair of the Faculty of Medicine's Higher Degrees Committee, member of various combined university and hospital committees, and the Medunsa Campus Merger Manager during the merger of MEDUNSA with the University of the North to form the University of Limpopo.

His life-long dedication to the pharmacy profession and pharmacists is known to all, being consulted nationally and internationally for his expertise in the fields of health and pharmaceutical services management. He chaired or vice-chaired a number of provincial and national committees, including the National Essential Drugs List Committees for Primary Health Care and for Hospitals. He advised the National Department of Health on matters relevant to registration, production, procurement and distribution, and overall management of pharmaceuticals, particularly during the period of implementation of the South African Drug Action Programme. A little-known fact is that he made an important contribution to the finalisation of the National Drug Policy in 1995, before its launch in 1996. He was also a player on the international stage, bringing the WHO-INRUD indicator methodology to the country and applying it in the public sector. His contribution to the WHO guide 'Developing pharmacy practice: A focus on patient care' is also noteworthy.

Prof Summers was a remarkable academic and well-known for his leadership role in pharmaceutical education and training. He directed, co-directed and/or contributed substantially to many national and international short courses. Of significance during the

HIV/AIDS era, was his role in the development, implementation and evaluation of training programmes, treatment adherence studies and pharmacovigilance. He also directed a number of provincial and national pharmaceutical operational research projects.

Prof Summers spent his career making a substantial contribution to clinical pharmacy and pharmaceutical services at a national level in South Africa. Throughout his career he was greatly loved as a teacher, a researcher, a supervisor, a mentor, and a life coach. In the words of Dr Andy Gray, 'Professor Summers was truly an 'eminence grise' in the clinical pharmacy arena. Many leading clinical pharmacists first cut their teeth in the previous MEDUNSA clinical pharmacy training programmes'. His work with the Department of Health contributed to strengthening systems and providing many pharmacists with the opportunity to grow their practices, develop critical research skills and implement rational medicines use interventions at scale. Prof Summers supervised and shaped the careers of numerous master's and doctoral degree candidates, who subsequently built successful careers in pharmaceutical services and clinical pharmacy, making a difference as leaders in the pharmacy profession. He has published and presented nationally and internationally over 400 research papers, full research reports, academic articles, books and book chapters.

Prof Summers was a remarkable pharmacist and leader whose unwavering dedication to the profession of pharmacy left a permanent mark on all who had the privilege of getting to know him and to work with him. He was considered a role model, mentor and tutor for many pharmacists. He was a very methodical professional, illustrated by some of his common phrases/quotes, *"Write it down, if it hasn't been recorded it didn't happen"; "Always proof-read what you have done"*; *"Who, How, Where, When, What"*; and *"Do what you say what you are going to do and see it through to the end"*.

Prof Summers lived a life of determination and an outstanding ability to lead and motivate people to always do good to others. In 2007 he was the guest speaker at the BPharm Oath-taking and shared two life lessons with the audience. The first was to deal with the circumstances we face and find the opportunities in them; use your skills and knowledge and those tools to benefit those around you. The other was *"Don't shovel dirt onto others. They may end up using your bad intentions to their own advantage"*. He was a visionary leader who believed in people and led with quiet strength. He was the epitome of Nelson Mandela's description: "A leader is like a shepherd. He stays behind the flock, letting the most nimble go out ahead, whereupon the others follow, not realizing that all along they are being directed from behind." However, Prof Summers' leadership style also illustrated the importance of a balanced strategy in which the leader must sometimes move out ahead of the flock and take a bold, new direction.

Prof Summers passionately served his profession as a member of the Pharmaceutical Society of South Africa (PSSA) and the South African Association of Hospital and Institutional Pharmacists (SAAHIP) since 1965, and as a founder Member of the Academy of Pharmaceutical Sciences (APSSA). He served the society in many capacities, especially the Northern Gauteng Branch of SAAHIP where he served as chairman and a committee member for many years. He played an important role in building the academic rigour of the SAAHIP Conference over the years, being one of the members who would often 'lead the way' with regard to protocol and ethics. In 1986 he was awarded Fellowship of the PSSA in recognition for his exceptional and consistent service in promoting the profession of pharmacy; and in 2018 he received an award of appreciation from the SAAHIP Northern Gauteng branch for exceptional and consistent involvement and significant contribution to the branch's activities, development and promotion. Furthermore, he was also a founder member and then Honorary Life Member of the Society of Cosmetic Chemists of South Africa.

In addition to his passion for health and pharmaceutical services, Prof Summers lived life to the fullest and was a devoted and caring family man, building strong family bonds. Outside of his pharmacy work, he found joy in spending time with his family in nature, serving as an elder in the church, reading widely, travelling, walking and keeping fit, enjoying jazz music and good food. Prof Summers' legacy will live on forever, reminding us that we control our attitudes and we choose to live a life of meaningful acts of love and service.

Hannelie Meyer

Celebrating the success of the 2025 APSSA Conference: Converging skills from molecule to patient care

Prof Michelle Viljoen (Conference convener) and **Prof Sarel Malan** (Director School of Pharmacy, University of the Western Cape)

The Academy of Pharmaceutical Sciences of the Pharmaceutical Society of South Africa (APSSA) hosted its annual scientific conference from 31 August to 2 September 2025 at the Lagoon Beach Hotel, Milnerton, Cape Town. The theme, "*Converging Skills: From Molecule to Patient Care*", captured the spirit of collaboration that defines modern pharmaceutical sciences that spans from cutting-edge laboratory research and patient-centred clinical practice.

This prestigious event brought together academic leaders, researchers, pharmacy students, and healthcare professionals from South Africa and beyond to discuss innovations, research, and best practices in the pharmaceutical sciences.

A setting that inspired innovation and collaboration

The Lagoon Beach Hotel offered an idyllic venue for the event, with breath-taking views of Table Mountain and the Atlantic Ocean forming a stunning backdrop for scientific exchange. The warm, collegial atmosphere was evident from the very start. The delegates that gathered to engage in three days of stimulating discussions and knowledge sharing were a dynamic and diverse mix.

With 150 delegates representing all nine Schools of Pharmacy in South Africa, as well as international guests and exhibitors, the conference truly reflected the national and global reach of this conference. The strong presence of postgraduate students once again highlighted APSSA's ongoing commitment to nurturing and showcasing emerging scientific talent.

Welcome event full of energy

The conference opened on a vibrant note with a captivating performance by Marimba Jam, a talented all-female marimba ensemble from Cape Town. Their rhythmic energy and uplifting music set the perfect tone for the days that followed and created an atmosphere of inspiration, connection, and celebration of shared purpose. Professor David Holgate, the Dean of the Faculty of Natural Sciences, University of the Western Cape (UWC) and Prof Sarel Malan, Director of the School of Pharmacy, warmly welcomed the delegates, guests and exhibitors.

Rich and diverse scientific programme

The scientific programme ran across two full days, commencing each morning with thought-provoking keynote addresses from leaders in the field, followed by parallel oral sessions showcasing diverse topics within pharmaceutical sciences, clinical pharmacy, pharmacy practice and pharmacy education.

Day one featured the ever-popular Young Scientist Competition, which drew 29 entries from postgraduate students presenting innovative research in pharmaceutics, pharmaceutical chemistry, pharmacology, clinical pharmacy and pharmacy practice. The depth and quality of the student presentations reaffirmed the vitality of pharmaceutical research in South Africa.

The 46th Annual General Meeting (AGM) of the Academy took place on Monday evening, 1 September 2025, where honorary memberships were awarded to Ms Nitsa Manolis and Dr Gareth Kilian in recognition of their long-standing dedication and service to APSSA.

Keynote and Invited Speakers: Enriching Minds and Inspiring Futures

The APSSA conference was honoured to host the following distinguished keynote speakers whose insights added immense value to the scientific programme: Prof Jacques Joubert (UWC); Prof Lauren Jonkman (University of Namibia); Prof Natalie Schellack (University of Pretoria) and Prof Paulo Rosa (University of Campinas, Brazil). Their presentations covered a spectrum of pharmaceutical innovations, from artificial intelligence in novel drug design to the evolving role of pharmacists in patient care and pharmacy education.

In addition, the esteemed invited speakers were: Dr Mariam Parker (UWC), Prof Clemence Tarirai (Tshwane University of Technology), Prof Clinton Veale (University of Cape Town), and Prof Vicente Rodilla (University CEU Cardenal Herrera, Spain). They captivated the audience with their depth of expertise and global perspectives, inspiring delegates to think beyond traditional boundaries.

Scientific closing highlights: Art, Science and Reflection

The final session captured the diversity and interdisciplinary nature of pharmacy. Prof Vicente Rodilla's presentation, "*The Painted Pharmacy: Medicines, Drugs and Poisons on Canvas*," was a fascinating exploration

of the depiction of pharmacy and medicine in classical art, merging science with culture and creativity. Prof Rod Walker, a respected figure in South African pharmacy education, offered a thought-provoking talk on "*Agenda 2063: Implications for the Pharmacy Curriculum*", sparking lively discussion on the future of pharmacy education in South Africa. Last but not least, Dr Rajesh Vagiri addressed an issue close to many delegates' hearts, "*Exploring Anxiety and Depression among Pharmacy Students at a South African University*". His presentation underscored the importance of mental health in students but also in academia and professional practice.

A night to remember: The Gatsby Gala Dinner

The conference culminated in an unforgettable "*Gatsby*" Gala Dinner with a black and gold dress code. Held in the elegant Adriatic Suite against the backdrop of a golden Cape Town sunset, the evening featured mouth-watering cuisine, Cape wines, and exuberant celebration. Prof Nadine Butler, as the Master of Ceremonies, ensured the evening flowed with humour and grace. APSSA Chairman Ms Lorraine Thom and Prof Sarel Malan addressed attendees, celebrating the achievements of the conference and the APSSA before presenting the annual awards. The rest of the evening was filled with laughter, lots of dancing and camaraderie, a perfect reflection of the APSSA spirit.

Recognising excellence: 2025 Award Recipients

Since 1979, the APSSA has been at the forefront of promoting research in pharmaceutical sciences and fostering participation by younger scientists through initiatives such as the Young Scientist Competition. Additionally, the APSSA recognise excellence in research, teaching, and learning through our Publication Awards and Teacher of the Year Award. The awards presented for 2025 included the following:

Young Scientist Awards – Pharmaceutical Sciences

Winner: Jasoda Govender (University of KwaZulu-Natal) - *Lipoic Acid grafted Dextran (LA-D): A Novel Redox Responsive Hybrid Nanostructured Lipid Carrier for Enhanced Antibiotic Delivery against Bacterial Sepsis*

Jasoda receiving her award from Lorraine (APSSA Chair)

Runner-up: Nicezelle Gernandt (North-West University) - *Exploring ivermectin's nanocarrier-mediated topical and transdermal delivery with co-processed solid particles*

Nicezelle and Lorraine

Young Scientist Awards – Pharmacy Practice and Clinical Pharmacy (Joint winners)

Nqobani Dabengwa (Rhodes University) – *Pharmacy students' lived experiences and perceptions of mental health support structures at Rhodes University*

Mieke Oosthuizen (University of the Western Cape) – *Molecule to medicine charts: Evaluating proton pump inhibitor use in hospitalized paediatric patients*

Mieke and Nqobani with Lorraine

Distinguished Teacher of the Year

Dr Mariam Parker (University of the Western Cape)

Publication Awards

Pharmaceutical Chemistry: Lesetja Legoabe (North-West University). *Quinolone analogues of benzothiazinone: Synthesis, antitubercular structure-activity relationship and ADME profiling.*

Prof Lesetja Legoabe receiving his award

Pharmaceutics: Yahya Choonara (University of the Witwatersrand). *In vivo evaluation of a Nano-enabled therapeutic vitreous substitute for the precise delivery of triamcinolone to the posterior segment of the eye.*

Pharmacology: Cailin van Staden (North-West University). *Posttraumatic anxiety-like behaviour in zebrafish is dose-dependently attenuated by the alpha-2A receptor agonist, guanfacine.*

Cailin with Lorraine

Pharmacy Practice: Maxine Turner (University of the Witwatersrand). *Primary Care Drug Therapy pharmacists in South Africa: Practice settings and conditions treated.*

Looking Ahead

This APSSA 2025 conference was proudly hosted by the School of Pharmacy of the University of the Western Cape. The connections made were impactful and we are looking forward to the next annual APSSA to meet up with old friends, new colleagues and collaborators to continue building, strengthening professional networks and lifelong friendships.

The message was clear that pharmaceutical sciences, clinical pharmacy, pharmacy practice and education in South Africa are thriving, collaborative and future-focused. The journey of "converging skills" will continue with renewed energy and vision.

Appreciation to the exhibitors, sponsors and local organising committee

The success of this APSSA 2025 conference would not have been possible without the generous support of our sponsor and exhibitors whose commitment to advancing pharmaceutical sciences is deeply appreciated.

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A special word of gratitude is extended to Nitsa Manolis and the UWC Local Organising Committee for their dedication, enthusiasm, and tireless efforts that ensured the outstanding success of this conference. The committee, comprising Prof Denzil Beukes, Prof Kene Obikeze, Prof Marique Aucamp, Prof Jane McCartney, Dr Erika Kapp, Ms Nicole Keuler, Ms Cosette Greyling, and Mr Rudy Maart, demonstrated exceptional commitment throughout. The UWC team was further strengthened by the invaluable support of postgraduate students and other academic staff members who assisted with numerous activities during the event

Access the full 2025 Conference Programme and Abstract Booklet (Flipbook):

https://heyzine.com/flip-book/53b4d814af.html

Prof Sarel Malan and Prof Michelle Viljoen with Lorraine Thom (APSSA Chair)

Prof Renier Coetzee (PSSA President), Lorraine Thom (APSSA Chair) and Nitsa Manolis

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