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A Brief Report on

AMR GUARDIANS OF TOMORROW

A Workshop series for Pharmacy Students in India

MARCH 2024



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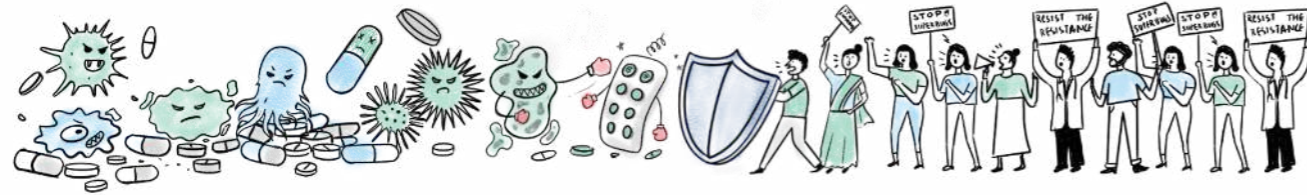
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March, 2024

AMR Guardians of Tomorrow: Report on a Workshop Series for Pharmacy Students in India. Khushi Goel, Sanjukta Mondal, Sarah Hyder Iqbal, and Somdatta Karak. Superheroes Against Superbugs (2024).



EXECUTIVE SUMMARY

Antimicrobial resistance (AMR) is a global health crisis threatening our ability to treat common infections. The World Health Organization (WHO) has warned that, if left unchecked, AMR could lead to a post-antibiotic era where common infections and minor injuries could become life-threatening. This underscores the urgent need for concerted efforts to address AMR through education, awareness, and the implementation of antimicrobial stewardship practices. To combat AMR effectively, it is essential to engage various stakeholders, including pharmacists, healthcare professionals, researchers, policymakers, and the general public.

India faces the grim challenge of regulating antibiotic consumption across different sectors to combat AMR as well as ensure these life-saving medicines are available to those in need. Pharmacy students, as future pharmacists and pharmaceutical professionals, play a critical role in tackling this issue. By equipping them with knowledge about AMR and the principles of antimicrobial stewardship, we can empower them to become advocates for responsible antimicrobial use in their future careers. With these objectives in mind, Superheroes Against Superbugs (SaS) organised **AMR Guardians of Tomorrow**, a series of hands-on interactive workshops for around 250 students pursuing pharmaceutical sciences and allied subjects in Delhi-NCR and Punjab regions in the month of March 2024, with support from Centriant Pharmaceuticals.

The workshops were conceptualised to sensitise future pharmacists and allied professionals about the public health challenges posed by AMR in India through a blend of expert lectures, interactive games, and educational activities aimed at addressing key issues surrounding AMR.

The workshops delved into various crucial themes, including the emergence of AMR, its underlying causes, the risks associated with unregulated over-the-counter antibiotic sales, the improper use of antimicrobial drugs in agriculture and animal farming, and the alarming presence of antimicrobial residues in pharmaceutical industry wastewater. Additionally, the workshops highlighted the recent research advancements and prospects in AMR, along with the One Health strategy for addressing AMR.

The workshops evoked critical thinking and demonstrated an urgent call-to-action among the pharmacy students to realise the importance of their profession in curbing the silent pandemic, AMR. The workshop also brought together diverse actors—educators, researchers, health care experts, and industry professionals—to raise awareness on this issue.



EMPOWERING TOMORROW'S PHARMACISTS TO ADDRESS AMR

Antimicrobial Resistance (AMR) represents a critical global health challenge as disease-causing microorganisms continuously evolve to develop resistance against previously effective drugs. This phenomenon, fueled by the misuse and overuse of antimicrobials across various sectors, poses a significant threat to public health worldwide. Alarming statistics reveal a grim picture, with approximately 1.27 million deaths directly attributed to bacterial AMR annually, surpassing the combined mortality rates of HIV, tuberculosis, and malaria.

Among the countries grappling with the devastating impact of AMR, India stands out with one of the highest mortality rates due to antibiotic-resistant infections caused by the irrational use of antibiotics across sectors. Despite being a major producer and exporter of antibiotics, the country faces significant challenges in regulating antibiotic consumption across industries. Although India's per-capita antibiotic consumption is lower than that of several other countries, the proportion of broad-spectrum antibiotic consumption that the WHO recommends for restricted use is high. Antibiotics are widely used as growth promoters in poultry farms and as fungicides in agriculture, further increasing the prevalence of antibiotic residues in the environment and escalating AMR.

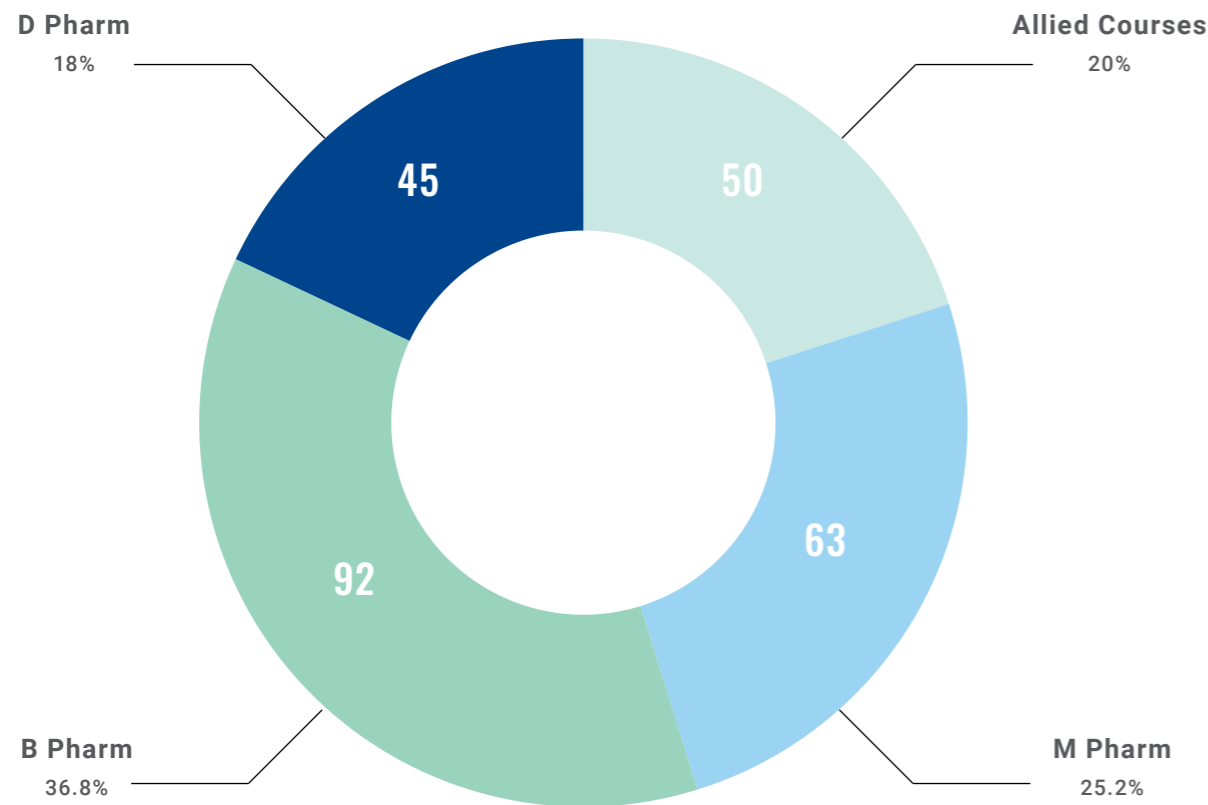
In India, antibiotics are frequently sold over-the-counter (OTC) at retail pharmacies, despite being prescription medications, leading to their widespread and unnecessary use. Moreover, a survey by the Indian Council for Medical Research (ICMR) across public and private hospitals highlighted a significant challenge in implementing Antimicrobial Stewardship (AMS) due to the shortage of clinical

pharmacists. This situation underscores the critical role of pharmacists in combating AMR, but gaps in pharmacy education hinder their ability to effectively recognise and manage the complexities of AMR and antimicrobial stewardship.

To address this gap and align with the first goal of the AMR National Action Plan, the **"AMR Guardians of Tomorrow"** workshop series was developed and implemented in colleges in Delhi NCR and Punjab. These workshops provided a platform for future pharmacists to gain the knowledge and tools they need to effectively mitigate the impact of AMR on public health.



"The misuse and overuse of antimicrobials in humans, animals and plants are the main drivers in the development of drug-resistant pathogens." - WHO



ABOUT THE WORKSHOPS

SaS organised three one-day educational workshops in March 2024 for around 250 undergraduate and postgraduate students studying pharmacy, pharmaceutical sciences, and allied subjects at the College of Pharmacy, Bela, Ropar, Punjab, Gurugram University, and Pavitra Institute of Pharmacy, Gurugram. The workshops were designed to sensitise students about AMR and encourage them to brainstorm viable solutions and see themselves as

changemakers. Each session combined interactive activities and expert talks featuring speakers from various sectors: healthcare professionals, researchers in diagnostics and therapeutics, policy experts, and pharmaceutical industry professionals. Topics at these workshops spanned AMR biology, the One Health approach, antimicrobial stewardship, infection control practices, and tackling socio-economic barriers in India.

Expert speakers



Dr Nusrat Shafiq
Clinical Pharmacology Unit,
PGIMER, Chandigarh



Dr Anshu Bharadwaj
Principal Scientist, CSIR-
Institute of Microbial
Technology, Chandigarh



Prof Sangeeta Sharma
Professor & Head, Department
of Neuropsychopharmacology,
Institute of Human Behaviour &
Allied Sciences, Delhi



Dr Rajeshwari Sinha
Programme Manager, Antibiotics
and AMR Programme, Sustainable
Food Systems Unit, Center for
Science and Environment (CSE),
New Delhi



Prof Samuel V Raj
Director, Centre for Drug Design
Discovery & Development (C4D)
and Professor, Microbiology &
Biotechnology at SRM University,
Haryana

Workshop activities included an AMR-themed Taboo game, role-playing scenarios on antibiotic use, case studies on diverse aspects of AMR, and group discussions to foster thought and dialogue, encouraging participants to devise solutions and create impactful awareness materials. The discussions and group activities were influential in

helping the workshop participants identify their roles as citizens and as professionals in combating AMR. By combining informative lectures with interactive sessions, the workshops helped deepen participants' understanding of AMR as a public health challenge and its contributing factors.

COLLEGE OF PHARMACY, BELA, ROPAR, PUNJAB

The 'AMR Guardians of Tomorrow' workshop series for pharmacy students kicked off on 5 March, 2024 at the College of Pharmacy, which was attended by over 160 participants, including BPharm, MPharm students, and PhD scholars.

The expert talk by **Dr. Nusrat Shafiq (PGIMER, Chandigarh)** highlighted the challenge of AMR in clinical settings, introducing the One Health approach to combat this public health crisis as well as the role pharmacists play in antibiotic stewardship by citing examples from her clinical practice. Dr Shafiq covered the following key themes:

- Hospitals, especially Intensive Care Units (ICUs) are the hotspots of AMR infections that often lead to lifelong disabilities and mortality in some cases.
- Adequate infection control practices such as WASH (Water, Sanitation, and Hygiene) practices, vaccination, avoiding overcrowding, etc. can help prevent AMR infections.
- There is a need for strategic initiatives to combat AMR. These include implementing AMS initiatives in hospitals and spreading awareness through public health projects, as well as involving clinical pharmacists in such roles.

Dr. Anshu Bhardwaj (CSIR-IMTECH, Chandigarh), with her colleague Dr. Priyadarshan Kinatukara, demystified the biology of AMR, the structure and action of antibiotics, and the evolution of bacterial resistance to antibiotics, as well as current research advances to tackle AMR. During her talk, Dr. Bhardwaj covered:

- The importance of surveillance initiatives to map the antibiotic consumption patterns and emergence of infections caused by drug-resistant bacteria in India;
- The use of in-silico models (digital doppelgangers of microbes) to better understand the underlying mechanism causing antibiotic resistance which can further help in developing targeted drugs to effectively treat infections

- Organising awareness campaigns and creative outreach activities to inform everyone across all levels of society.

Mr. Rajiv Narang and Mr. Mohit Dhamija from Centrient Pharmaceuticals discussed the pharmaceutical industry's role in combating AMR, emphasising self-regulation and the role of the **AMR Industry Alliance**.

The SaS facilitators further enhanced learning through interactive activities and games, including a role play activity on responsible use of antibiotics and interactive case studies highlighting the factors affecting the onset of drug resistant infection in different scenarios. The workshop concluded with a creative activity where the participants reflected upon their learnings from the day-long workshop and developed posters, memes, infographics, slogans, and various other creative content on AMR to be used as awareness material in future events.



GURUGRAM UNIVERSITY, HARYANA

The second workshop in the series was conducted for over 40 students from the MPharm and MSc Chemistry programmes at Gurugram University on 14 March, 2024. **Dr. Sarala Balachandran**, Chairperson of the Department of Chemistry, kicked off the event with a powerful call to action while stressing the urgent need for collective action to combat the silent pandemic of AMR.

An expert lecture by **Dr. Rajeshwari Sinha** from the **Centre for Science and Environment (CSE), New Delhi**, shed light on the escalating threat of AMR infections in low-income countries and discussed the concept of 'One Health', emphasising that AMR is not just a human issue but a global issue that transcends borders and affects the health of animals, plants, and the environment. Dr. Sinha also highlighted the following:

- The natural process by which bacteria develop resistance against antibiotics.
- The detrimental effect of AMR on meeting Sustainable Development Goals (SDGs), including zero hunger, no poverty, and clean water and sanitation.
- The global development of resistance to most existing antibiotics poses a threat across ages, from neonatal to elderly populations.

Prof. Samuel Raj from **SRM University, Haryana**, engaged the students in a discussion about potential therapeutic alternatives to antibiotics, the AWaRe (Access, Watch, Reserve) framework of drug use, and the significance of sanitation in preventing AMR. He underscored the necessity for harmonised surveillance across various ecosystems and the pivotal role of R&D partnerships in combating AMR. Apart from this, Dr. Samuel Raj also addressed the following issues:

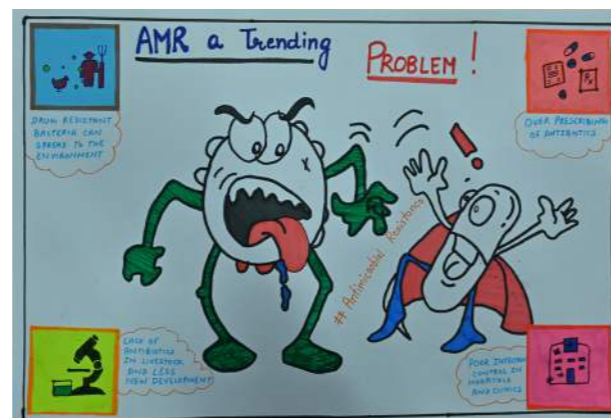
- Pharmaceutical companies' lack of interest in antibiotic development, driven by low profitability, hinders the fight against antimicrobial resistance.
- India's TB burden, noting the evolution of TB bacteria from multi-drug resistant (MDR) to extensively drug resistant (XDR) and now completely drug resistant (CDR) strains.

- Antibiotic misuse, emphasising unnecessary usage for common colds and the risks of self-prescription based on past experiences.

Mr. Namit Joshi from **Centrient Pharmaceuticals** informed our audience on the role of pharmaceutical companies in antibiotic production and purchase. He emphasised responsible Active Pharmaceutical Ingredient (API) disposal and encouraged the students to visit the wastewater treatment plant at Centrient's Toansa manufacturing unit to understand how industrial waste water is carefully treated before it is released into the environment. He also highlighted the following:

- The shift from chemically made antibiotics to enzymatic ones is promoting green manufacturing.
- The need for antibacterial waste management in the farming sector.
- The use of artificial intelligence and machine learning is accelerating drug development, enabling faster human trials and new drug launches

Through interactive activities and discussions, participants proposed responsible policies and actions, aiming to enhance AMR awareness within their personal and professional networks. Similar to the College of Pharmacy workshop, the second workshop also concluded with students sharing their learning through informational posters that they aimed to use to spread further awareness about AMR.



PAVITRA INSTITUTE OF PHARMACY, GURUGRAM, HARYANA

SaS concluded the third and final edition of the AMR Guardians of Tomorrow workshop series at the Pavitra Institute of Pharmacy on 23 March 2024. The workshop was designed to engage around 50 students who are pursuing a Diploma in Pharmacy and will soon operate pharmacies. This workshop followed the free-flowing approach of 'Sawal-Jawab' (Question and Answer) to allow for candid conversations between the participants and invited experts on the issues related to AMR.

Prof Sangeeta Sharma of the Delhi Society for Promotion of Rational Use of Drugs (DSPRUD) delivered an expert talk that used regional examples to engage students in a discussion about what AMR is, how it affects our lives, and debunked a few common antibiotic myths. She discussed the risks of dispensing over-the-counter antibiotics and warned future pharmacy owners about the importance of referring patients to doctors to avoid potential complications caused by misdiagnosis and the use of over-the-counter medications. Dr. Sharma also briefed the audience on:

- Alexander Flemming's prediction about misuse of penicillin and how it could lead to the selection of antibiotic resistant bacteria.
- Pharmacists serve as a bridge between patient and doctor in the healthcare ecosystem.
- Dealing with patients insisting on buying antibiotics without a prescription.

Mr. Namit Joshi of Centrient Pharmaceuticals led an engaging session, explaining the critical role pharmacists play in India's healthcare system, particularly given our country's low doctor-to-citizen ratio. He emphasised the gravity of the AMR situation by sharing both statistical data and personal experiences. He emphasised how AMR is gradually overtaking diseases like cancer and HIV as the leading cause of death. He acknowledged that the responsibility to prevent antibiotic misuse extends beyond pharmacists and necessitates the cooperation of the industry, healthcare providers, pharmacists, and patients. He also highlighted:

- The existing problem of pharmacists selling their diplomas and certificates to pharmacy stores
- The overuse and misuse of antibiotics like tetracycline in poultry, honey, and animal farming
- The need for pharmacists to learn about AMR to spread awareness among their customers

During the *Sawal-Jawab* session, participants asked pertinent questions around appropriate use of antibiotics and how to raise AMR awareness among customers. During the closing session, students were encouraged to create awareness materials based on their understanding of the issue in order to spread information about this critical topic to their peers and the larger public.

The teachers, like the students, took an active role in the workshop discussions and their participation not only promoted deeper understanding and engagement but also ensured that the AMR awareness message would be carried forward in the institution.



SUSTAINING CONVERSATIONS AND ACTION ON AMR

- To encourage students to continue exploring the theme, two winning teams from the College of Pharmacy, were given the opportunity to visit **CSIR-IMTECH** to learn more about the institute's research and gain valuable insights into cutting-edge advancements in the fields of AMR and Drug Discovery.
- Following the workshop, the College of Pharmacy also announced the creation of an **AMR Club** with the goal of extending the knowledge gained at the workshop to the wider community. The club aims to sustain awareness efforts on AMR and actively contribute to addressing this global issue, emphasising a commitment to long-term engagement and education in healthcare and beyond.
- One group at College of Pharmacy also conceptualised an **AMR-themed skit play** to perform in local areas while doing awareness campaigns. Together, these activities and visits would help nurture the students' interest in AMR as a public health concern and give wings to innovative ideas to tackle the issue.
- In another bid to inspire our young audience, workshop speaker Prof. Samuel Raj extended an opportunity to two students from Gurugram University to attend the **3rd International Conference on 'Antimicrobial Resistance (AMR), Novel Drug Discovery, and Vaccine Development'** organised by SRM University, Haryana, at India Habitat Center (IHC), New Delhi, on 18-20 March 2024.
- The winning team from Gurugram University was provided with the opportunity to visit Prof. Samuel's **Drug Discovery Lab at SRM University, Sonapat, Haryana**, where he and his team have been working on synthesising novel therapeutics to treat AMR infections. Students were also encouraged to take up research projects in related areas and further explore collaboration opportunities with other research labs and industry partners.

- One of the attendees, Mr. Rahul, from the workshop held at Pavitra Institute of Pharmacy, identified a significant gap in AMR awareness among the general population, stemming from the existing language barriers. He created a short video for SaS sharing his views on the importance of making conversations around AMR more inclusive and easily understood by people with diverse language skills and literacy levels.

The active participation of faculty in all workshops gave us confidence that the lessons from this workshop would be carried forward.



REFLECTIONS FROM AMR EXPERTS AND PARTICIPANTS

As we gathered our thoughts and learnings following these AMR awareness workshops, a mosaic of perspectives emerged as students reflected on their roles, each reflecting a distinct aspect of their commitment to AMR prevention.

"Attending the AMR workshop was truly enlightening! The engaging sessions, insightful discussions, and practical strategies shared have equipped me with valuable knowledge and tools to tackle antibiotic resistance effectively. Thanks to the organisers for such a well-rounded and impactful event."

~ Workshop Participant from College of Pharmacy

"Speaking of the expert talks, it was informative but the delivery of information through games was much more impactful. Speaking honestly, experts' talks do get boring at one point but not the one we attended. Thank you for sharing, including us in this AMR session it was actually informative."

~ Workshop Participant from Gurugram University

"Settings to understand the threats posed by antimicrobial resistance, and the way they can help to track this major health issue."

~ Workshop Participant from Pavitra Institute of Pharmacy

"Pharmacy students can play a crucial role in combating AMR by serving as frontline advocates for rational antibiotic use, fostering stewardship programmes, and conducting research to develop new strategies and treatments. Their involvement is pivotal in shaping a sustainable healthcare system that preserves the effectiveness of antimicrobials for future generations. Towards this, the SaS workshop on engaging pharmacy students was phenomenal, both in terms of engagement and impact!"

~ Dr Anshu Bhardwaj (Principal Scientist, CSIR-IMTECH, Chandigarh)

"Young participants' dedication at the workshop was inspiring, and I'm confident they'll continue advocating for AMR awareness. Let's stay committed as AMR Guardians of Tomorrow and work together to address this challenge."

~ Prof Sangeeta Sharma (Delhi Society for Promotion and Rational Use of Drugs)

"Pharmacy students are at the forefront of the fight against AMR, and their actions are critical in shaping the response to this critical health issue. Our college was delighted to host this one-of-a-kind workshop to inspire and inform students, and we hope to expand these efforts throughout our institution and beyond."

~ Dr. Rahul Kumar Sharma (Workshop Coordinator, College of Pharmacy, Ropar, Punjab)



Key learnings and recommendations

1. Workshop Planning and Execution

- 1. Engaging with the Host Institution:** Effective communication during the planning phase is crucial for ensuring all stakeholders are aligned regarding objectives, expectations, and logistical arrangements of such workshops. The enthusiastic involvement of workshop coordinators and faculty members from the host institution plays a significant role in guaranteeing the success of such endeavours.
- 2. Logistics and Infrastructure Support:** Adequate infrastructure and logistical support are indispensable for a seamless workshop experience. Ensuring a well-lit room equipped with appropriate technological gadgets and readily available assistance can significantly enhance the learning environment and minimise disruptions. Thoughtful consideration of space layout to optimise interaction and engagement among participants can be helpful for hands-on workshops like these.
- 3. Targeting Interested Participants:** Quality over

- quantity should be the guiding principle when it comes to attracting participants. Rather than merely filling seats, it's imperative to target students who are genuinely interested in the subject matter and interested in taking the mission forward. This can be achieved through targeted outreach and promotion efforts, highlighting the relevance and significance of the workshop to attract motivated attendees eager to engage in meaningful discussions and learning experiences.
- 4. Time Management:** Effective time management on the day of the workshop is important for ensuring a smooth flow of activities and maximising learning opportunities. Developing a detailed schedule with allocated time slots for each session, breaks, and transitions is essential. Sharing the schedule with speakers and participants in advance helps set clear expectations and encourages punctuality, thereby ensuring that the workshop stays on track according to the agenda.

2. Workshop Design and Engagement Strategy

- 1. Early Engagement in AMR Education:** Despite students' modest familiarity with the concept of AMR, a comprehensive understanding of the issue was grossly lacking. To bridge this gap, the workshops included a variety of AMR topics as well as cutting-edge, contemporary advancements to address the issue by bringing together a diverse group of AMR experts. Engaging pharmacy students early on in their education to instil a lifelong commitment to combating AMR effectively is essential. Therefore, in addition to such workshops, educational institutions should consider introducing regular modules on AMR in pharmacy education.
- 2. Engaging students through creative learning:** High levels of student engagement in the workshop activities and games highlighted the effectiveness of interactive and creative

- learning methods over traditional lectures. To unpack the complexities of AMR, it is crucial to integrate activities that promote critical thinking and problem-solving. These methods not only capture students' interest but also deepen their understanding and commitment to addressing AMR.
- 3. Encouraging co-production of resources:** Providing educational resources during workshops is essential, but empowering students to create their own materials is equally valuable. This collaborative approach not only prompts students to reflect on their learning but also fosters a sense of ownership over the materials and their subsequent use for awareness-raising. This approach also enhances the impact and relevance of the awareness content, as was evident in the creative outputs of the participants.

3. Language and Relevance

- 1. Adapting to linguistic and cultural diversity:** Recognising India's rich linguistic and cultural diversity and the need to make AMR concepts comprehensible, the workshop facilitators and speakers adeptly tailored their communication style and language to the preferences and backgrounds of the students during the workshops. Conducting sessions in English, Hindi, and Punjabi and using relevant examples ensured that every student felt engaged and could easily grasp the concepts discussed.
- 2. Encouraging personalised communication:** Students were encouraged to design infographics and posters in languages and styles they were most comfortable with, fostering a personalised and deeper connection with the informational material and messages that are relevant.
- 3. Localising solutions through case studies:** Case studies provided a platform for participants to examine practices within pharmacies and

- healthcare settings and consider regulations more closely. These discussions spurred thinking about localised actions and solutions that could effectively address AMR challenges specific to their communities.
- 4. Framing questions for evaluation:** The post-workshop questionnaire received poor responses, with occasional misunderstandings of questions possibly due to ambiguous wording. This ambiguity may stem from cultural or linguistic differences and varying levels of English proficiency, highlighting the need for meticulous questionnaire design. Using clear and straightforward language, steering clear of technical terms, testing with diverse participants beforehand, and offering sufficient context can enhance the reliability of responses in an AMR-related questionnaire. Students can also be incentivised to share their learnings in a post-workshop questionnaire.

4. Continuing Education and Proactive Engagement

- 1. Expanding learning opportunities beyond workshops:**

We recognise that a day-long learning session is not adequate for a deep dive into the expansive topic of AMR and sustaining student interest. Therefore, we ensured that the workshops also served as a springboard for continued education on AMR by providing opportunities for participating students to visit some of the speakers' institutions that are actively developing AMR solutions. This interaction underscores the critical role that research, healthcare, and the pharmaceutical industry can play in engaging pharmacy students nationwide, who are typically excluded from these learning opportunities.

- 2. Leveraging innate creativity and changemaker spirit:**

Following SaS' recommendation, some participating colleges are forming AMR clubs with the goal of sustaining student involvement and outreach in AMR education and awareness in their college and community. To nurture their inherent creativity and passion to be changemakers, educational institutions should provide opportunities for students to lead community awareness campaigns that utilise local languages and culturally appropriate messaging to enhance impact.



CONCLUSIONS

As future healthcare professionals, pharmacy students play a significant role in the responsible use of antimicrobial drugs and the prevention of AMR. Through these workshops, we initiated crucial conversations with aspiring pharmacists and pharmaceutical professionals about the factors contributing to this silent pandemic.

Discussions covered a range of topics, including the over-the-counter sale of antibiotics, self-medication, the irresponsible use of antimicrobial drugs in agriculture and animal husbandry, and the prevalence of antimicrobial residues in wastewater from pharmaceutical industries, among other key issues.

Overall, these AMR workshops across various regions and demographics served as a vital catalyst for action and engagement on AMR. They showcased

the transformative role of participatory education in cultivating an informed and proactive generation. In the absence of an AMR curriculum in current pharmacy courses, these types of educational workshops have the potential to leave a lasting impact on students, inspiring them to become active advocates in the fight against AMR.

Moreover, the workshop series was unique for its ability to unite a diverse array of stakeholders—including educators, policy experts, researchers, and industry professionals—in a collaborative effort to raise awareness about AMR. By fostering such interdisciplinary collaboration and empowering future pharmacists, these workshops serve as a pivotal step towards combating AMR on multiple fronts and shaping a more resilient healthcare landscape in the country.

EDUCATIONAL RESOURCES



ANNEXURES



Use your phone's camera or a QR scanner app to scan the QR code. Hold it steady for 2-3 seconds. Then, follow the link that appears to access detailed information.



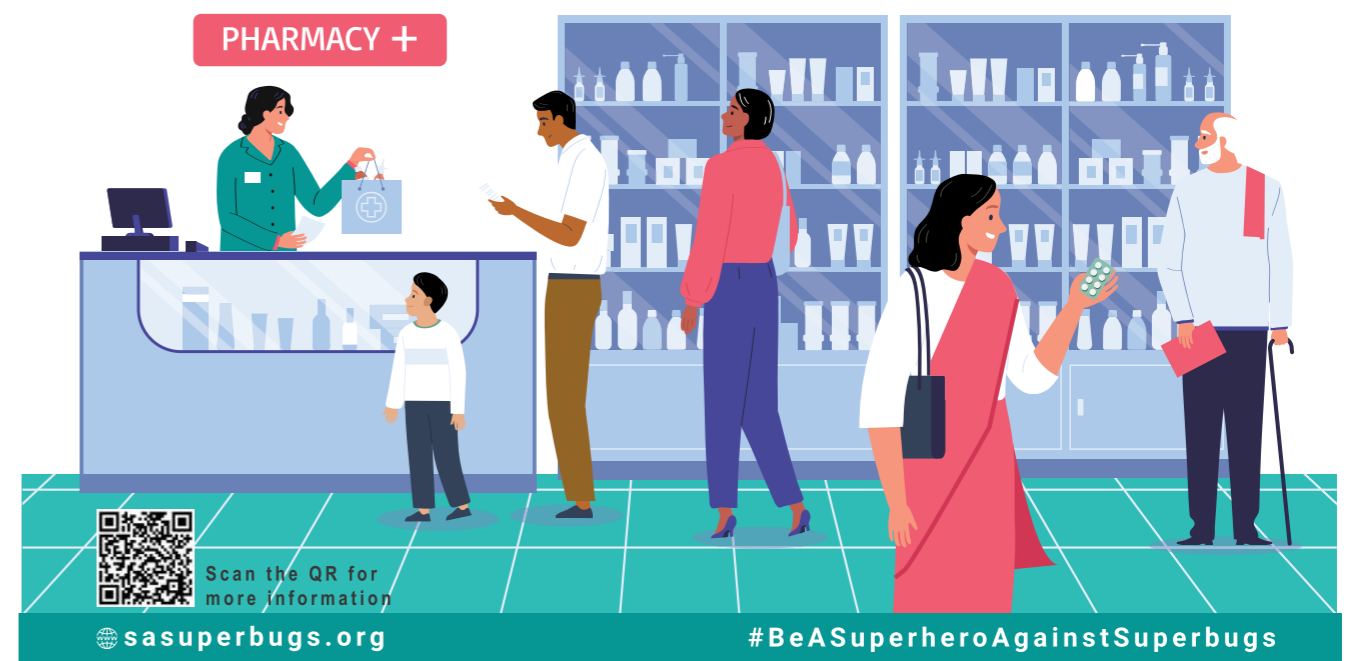
I AM A SMART PHARMACIST

- I only sell antibiotics with a valid doctor's prescription.
- I encourage follow-up doctor visits before repeating prescriptions.
- I carefully record all antibiotic sales to ensure transparency and safety.
- I educate patients on correct antibiotic usage based on medical guidelines.

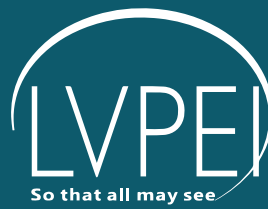
I AM A SMART CUSTOMER

- I consult a doctor before starting any prescription medications, including antibiotics.
- I complete all medication as prescribed, never sharing with others.
- I understand that self-medication can pose a health risk.
- I respect pharmacy guidelines and never try to buy medications without a prescription.

Preventing Antimicrobial Resistance (AMR) Together!



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