SUPERHEROES AGAINST SUPERBUGS

REPORT

India Alliance
DBT wellcome

Introduction

Superheroes against Superbugs (*SaS*) is a public engagement program that aims to raise awareness on antibiotic resistance and promote community action by engaging with young children in India.

India is at the forefront of the global epidemic of Antimicrobial Resistance (AMR). Studies estimate that 58,000 newborns in India die each year due to infections caused by resistant superbugs[1]. AMR is a natural phenomenon exhibited by microbes wherein they can resist the toxic effects of antimicrobials. Overuse and misuse of antibiotics by us has accelerated the development of antibiotic resistance, a subset of AMR. There is significantly high incidence of inappropriate use of antibiotics and resistance in India due to their easy availability and misinformed consumption[2]. While India is the largest consumer of antibiotics for human health in the previous decade[3], a recent study indicates that 64% of antibiotics sold in India are unapproved[4]. Further, estimates indicate that 80% of global antibiotics are manufactured in India and China[5], the effluent from the pharmaceutical industry further adding to the problem. There have also been alarming reports of last-resort antibiotics like Colistin being used in the poultry industry in India[6]. However, public in India is largely unaware of the issue of AMR. There is therefore an urgent need to initiate and sustain a dialogue on AMR. The National Action Plan[7] (NAP) against AMR of the Government of India aligns with the Global Action Plan[8] and outlines its first objective as "improving awareness and understanding of AMR through effective communication, education and training".

The *SaS* project aligns with the objectives of NAP and GAP's of raising public awareness on AMR.

May 2019

About the Project

Young minds are capable of influencing behaviours around them and bringing about transformative change when equipped with the right tools.

The *SaS* project emphasises the need for the general public to become 'superheroes' as much as we need our scientists to fight this century's biggest health threat, by improving scientific understanding of antibiotic resistance so that appropriate measures can be taken at an individual and community level.

The *SaS* pilot programme was set up to empower young children with knowledge on antibiotic resistance and partner with them in raising public awareness about its perils. In addition to raising awareness of the issue, we were keen to explore the most appropriate communication and engagement strategy to promote public action on AMR.

The pilot program that was launched in January 2018, broadly comprised of the following activities:

- social media page to disseminate information on antibiotic resistance targeted at non-specialist, lay audience in English
- development of interactive games and creative activities around various concepts related to microbes, infections, antibiotics and resistance aimed at improving scientific understanding of antibiotic resistance for young children
- workshops at schools that included, in addition to interactive games and creative activities, interactive sessions between children and different stakeholders such as scientists, doctors, pharmacists and parents; development of skits, posters and comics by children to initiate and sustain a dialogue on antibiotic resistance
- building partnerships to ensure sustainability of the project beyond the pilot

Our Approach

We combined innovative science education and public engagement approaches (on the lines of Child-to-Child Approach) to ensure that the project not only empowers young children with scientific knowledge but equips them with tools to use this knowledge to promote awareness and action in their sphere of influence. These approaches harnessed the inherent enthusiasm and creativity of young children to convey the complexity of the subject at hand.

We adopted an unorthodox approach to teaching scientific concepts to the young participants. The complex topic of antibiotic resistance was conveyed through a combination of fun hands-on activities, short interactive sessions by the *SaS* team and scientists and use of short animation films. Additionally, engaging homework, skits and poster-making were employed to keep the interest of these young children alive and to ensure they can effectively apply the information from these didactic sessions.

Our Approach

Story is a great vehicle to deliver a message. Hence, we decided to use the medium of *grassroots comics*, a simple, cost effective yet powerful engagement tool that requires only a black pen and a paper and provides a medium for people, irrespective of their education and literacy level, to express themselves through visual storytelling. It is particularly useful to convey serious issues in a uniquely creative way that piques the interest of children and adults alike. Another advantage of developing grassroots comics is that they can be easily reproduced and exhibited. It also establishes the bond between creator and the reader and appears more personal and credible.

Workshops at Schools

In order to share scientific knowledge on antibiotic resistance and its public health impact, two workshops of three days were held at a government and a private school in the city of Hyderabad, India. 30 children from each school, in the age group of 13-14 years (9th grade/Year 9), participated in various interactive hands on activities designed around microbes, infections, antibiotics and antibiotic resistance.

The program also provided a platform for the children to initiate a dialogue with experts. 'Ask a scientist' sessions at the workshop enabled these children to interact with scientists working in the fields of virology, immunology, microbiology and tuberculosis, to pique their interest on the issue, further inspiring them to seek information and act. The 'meet the doctor' session gave them an opportunity to engage with a pediatrician on health, hygiene, nutrition and preventing infections while also discussing misuse of antibiotics based on their own experiences.

The homework during the workshops were designed to solicit children's own experiences by encouraging them to engage with their parents on antibiotic usage in their households and interact with their school nurse and local city pharmacies in understanding the prevalent practices in prescribing and dispensing antibiotics, respectively. For example, they visited a local pharmacy with their parents to buy antibiotics. In the process they gathered information on antibiotic dispensing practice, knowledge on red line and antibiotic resistance etc.

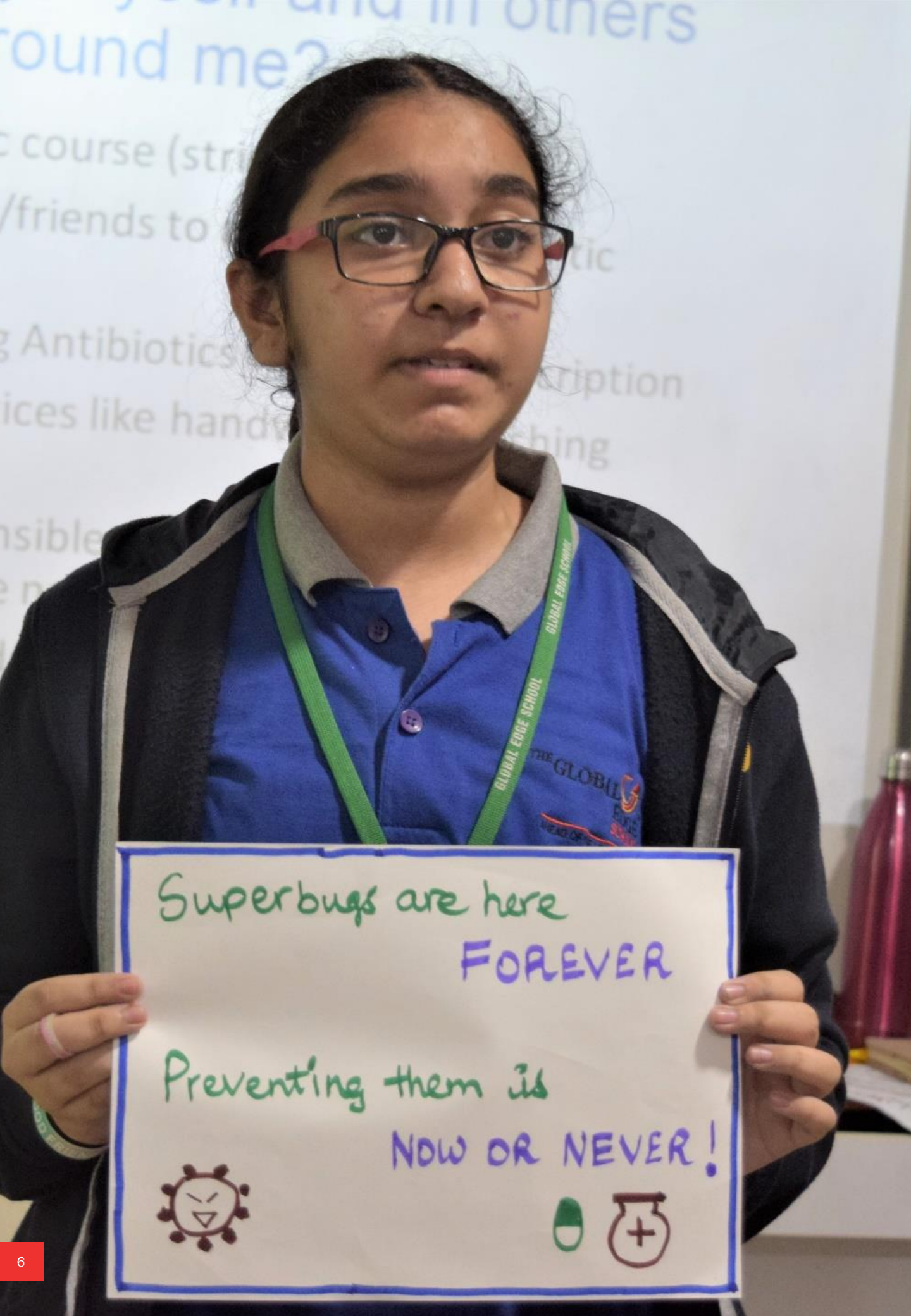
Brief session on developing a story was included to help the students become more effective story-tellers. Once armed with knowledge, these children were encouraged to develop short plays, informational posters and comics that they could use to engage with their peers, teachers and parents on the issue of antibiotic resistance.

The workshops were designed and delivered slightly differently for the two schools because of the educational and socio-cultural differences.

Details of the sessions at the workshops are as follows:

1. Inter-relatedness between living things on earth, with a focus on human beings

This section was based on articulating the cellular and molecular commonalities between different life forms on earth, and how human life is interlinked with other forms of life through video led discussions.


Superbugs are here
FOREVER
Preventing them is
NOW OR NEVER!

Our Approach

2. Understand the differences between different types of microbes
Through a cue-card activity, this session focused on delineating the differences between the microbial life forms in terms of their size, shape, structure, interactions with humans and effects they have on human life.

3. Understand the different relationships we share with microbes
This session focused on how intricately connected we are to the microbial world and the differential relations we have with them. One of the activities at this session is using glo-germ to understand the omnipresence of microbes.

4. Understand different strategies to combat bugs
Through role play, students figure out the different modes of infection by viruses and bacteria and understand the different ways to fight disease-causing microbes through a video-led discussion. Antibiotics are introduced.

5. 'Dal mein kuch kaala hai' - When antibiotics don't work
This interactive hands-on activity used every day pulses (simulating microbes) and toothpicks (simulating antibiotics) to demonstrate:
1. The importance of finishing the full course of antibiotics
2. Why antibiotics are ineffective against viruses
3. How antibiotics affect the gut microbes causing some of the common side-effects
4. Antibiotic Resistance

6. 'From bugs to Superbugs'- How do bacteria become resistant to antibiotics
In this activity, student volunteers (simulating the trait of different heights) tried to catch food hanging at a height (which simulates an environment with elevated food source) to understand the concept of selective pressure and natural selection and through parallels understand how bugs evolve

7. 'Superbug Babies'- Spread of Superbugs and Antibiotic Resistance
Through this interactive activity, students learnt how rapidly bacteria reproduce, and model how this reproduction rate makes it possible for populations of bacteria to quickly adapt to new antibiotics. This also demonstrated how stopping antibiotic mid-course will lead to antibiotic resistance and reinforced how misuse and overuse of antibiotics contributes to resistance

8. 'Bugs swap powers!' - Spread of Superbugs and Antibiotic Resistance
Students modeled how horizontal gene transfer contributes to the spread of antibiotic resistance genes in bacteria by simulating the process of conjugation and visualizing how a population of bacteria can evolve to become antibiotic resistant.

9. How does Antibiotic Resistance affect you?
This session focused on why antibiotic resistance has become such a big public health issue and how it might affect the children and their near and dear ones. The discussions at this session included the environmental aspects of antibiotic resistance including overuse of antibiotics in animals and farming and the problem of waste disposal by pharmaceutical companies.

10. 'Ask a Scientist' sessions provided the children with a chance to interact with different scientists working on relevant research areas. Some of the topics covered by the scientists are as follows:

Our Approach

How do scientists study tiny organisms? by Dr Rupinder Kaur, Microbiologist studying fungal infections

How can we beat the bad bugs in the lab? by Dr Sweena Chaudhari, Immunologist & Dr Raghunand R.Tirumalai, Tuberculosis Researcher

Why is it so difficult to kill these Superbugs? by Dr. Shahid Jameel, Virologist

11. In the **Meet the Doctor** session, children engaged with Dr. Sivranjani Santosh, a pediatrician on **"How to lead a healthy, infection-free life?"**

12. **What's your Superhero against Superbug story?** Mr. Sharad Sharma, World Comics India, www.worldcomicsindia.com encouraged children to narrate stories on AMR through grassroots comics.

13. **Story-telling through animation films – How to bring your Superhero against superbugs story alive.** A session by Mr Chiru Yerra, Mr Mahesh Kudupudi, VFX Animator & Mr Sunny Blake Ganta, Visual Effects Creative Director showed the children how animations can be used to bring a story alive.

Follow up group discussions and sessions were held with the students between 2-4 months after these workshops to hear about how they engaged with their peers and community and to gauge how much knowledge they retained after the workshop. This gave us a good measure of the effectiveness of our approach.

At the follow up session, participating students at the government school were encouraged to develop stories around the issue of antibiotic resistance using the knowledge gained at the workshop. These sessions were facilitated by Mr Sharad Sharma, founder of World Comics India, who helped the children to transform their stories into *grassroots comics*.

In addition to the focused group discussion, the students were encouraged to work in groups and write stories for an animation film on antibiotic resistance. The sessions led by animation and VFX experts involved engaging exercises aimed at familiarising the participants with various aspects of making an animation film. The result was fun out-of-the-box stories narrated through various central characters on different aspects of antibiotic resistance.

The engagement with the private school continued in two separate events during the World Antibiotic Awareness Week 2018. The *SaS* team participated in a free-wheeling art event at the school titled 'Artopia'. The team used fun 'straw art' as a primer to introduce bugs and hand hygiene to young students while the parents were engaged in a conversation on antibiotic usage and resistance through the student's comics from the workshop. In addition, high-school students participated in 'resistance assembly', where the SaS team helped other students and teachers to understand how antibiotic resistance affects everyone.

Grassroot comics

Each of the 60 children from both the workshops produced comics that covered various aspects of antibiotic resistance including health andhygiene, misuse and overuse of antibiotics, environmental issues surrounding antibiotic resistance, misuse of antibiotics in animal farming and science behind antibiotic resistance.

Our Approach

The complexities of antibiotic resistance were simplified in a manner that could be understood by anyone. The comics use humour, irony, sarcasm and various other local communication styles and references to alert the reader of the dangers of antibiotic resistance but maintained an optimistic undertone.

The children used these comics and stories to further engage with their peers, teachers, parents and community. There was energy and excitement at these sessions due to the bond between the creator and the reader, that made the stories a lot more relevant to the reader. By its very nature, comics appealed to children and adults alike and made the audience more receptive to the message than a regular awareness campaign. A sense of ownership of the work ensured that the dialogue on antibiotic resistance, initiated during these sessions was sustained beyond the workshop. Some children also chose to make the comics in vernacular languages further increasing the reach of the message.

Outcomes evaluation

A formal evaluation plan was put in place to measure the effectiveness of the workshops in improving knowledge of antibiotic resistance. The assessment was especially important in evaluating the effectiveness of the non-traditional teaching methods that were employed to teach the scientific concepts. Evaluation involved assessment of pre- and post- feedback forms from the participants, group discussions and interviews at various time points after the engagement programme.

Overall, the results from the evaluation showed that the workshop and engagement format was effective in conveying the science and problem posed by AMR. Majority of the participants indicated that key take home messages for them were an understanding of Antibiotic Action, Antibiotic Resistance, Superbugs and use and misuse of Antibiotics.

Schools	**Pre-feedback forms**			**Post-feedback forms**		
	% students knew about Antibiotic Resistance	% students knew about Superbugs	% students knew Antibiotic specifically target Bacteria	% students could define Antibiotic Resistance	% students could define Superbugs	% students knew Antibiotic specifically target Bacteria
School 1	0	0	13%	83%	67%	74%
School 2	7%	3%	21%	85%	92%	92%

Outcomes evaluation

The project was successful in initiating a dialogue on antibiotic resistance among our partners (animation experts and the *grassroots comics* facilitator), parents and school teachers as well. For e.g. some of the school teachers and our creative collaborators were unaware of the problem posed by the excessive use and/or misuse of antibiotics and lacked basic knowledge on infections at the start of the project. Short questionnaire shared with parents of government school children also showed that participating students were able to make their parents understand the necessary steps to be taken at individual level to prevent infections and to stop superbugs.

One of the significant, tangible impacts of the project was installation of dustbins, soaps and good hand washing practice instructions in all toilets and cleaning the entire campus every week at the government school.

It is also encouraging to see that participating schools have started the conversation on the issue and are including sessions on antibiotic resistance in their school programmes. For e.g, teachers at one of the schools wrote about antibiotic resistance and *SaS* in their newsletter which was sent to parents. The teachers at both the schools were very supportive of this programme even though it meant time away from regular classes for the students.

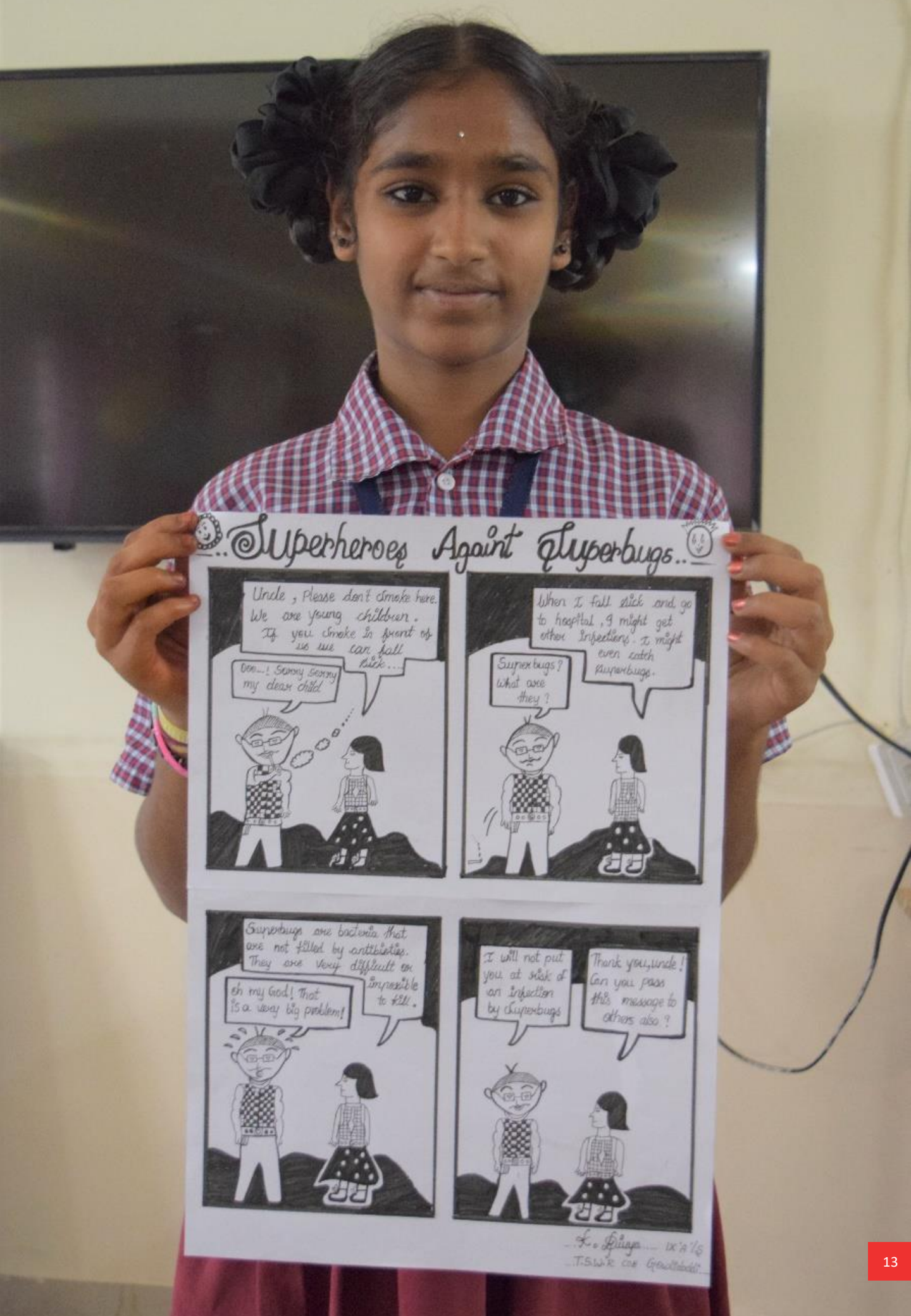
Another important objective of the pilot was to develop institutional partnerships to ensure sustainability. Partner research institute CCMB has mobilised its researchers to take regular workshops on this topic.

Challenges and solutions

Conveying the complexity of antibiotic resistance to young students was one of our major challenges. We overcame that by using videos, roleplays and fun hands-on activities to explain the science behind antibiotic resistance so that they could appreciate the public health problem that it poses.

Another challenge was to make the problem relatable to children. We tackled this by employing creative activities such as skits and comics that provided these children ample time to reflect and think deeply about how this problem affects them on a personal level.

Scientific accuracy and oversimplification of the AMR issue in comics. Considering the comics were to be used to spread further awareness we wanted to ensure scientific accuracy and avoid oversimplification of the AMR issue in comics. We felt a close monitoring of the comics during development would impact the feelings of ownership for these comics and therefore, we made sure that involvement of the workshop facilitators was minimal when the student developed their stories.


Superheroes Againt Superbugs
Uncle, Please don't smoke here. We are young children. If you smoke in front of us we can fall sick...
Oee...! Sorry sorry my dear child
When I fall sick and go to hospital, I might get other Infections. I might even catch Superbugs.
Superbugs? What are they?
Superbugs are bacteria that are not killed by antibiotics. They are very difficult or impossible to kill.
eh my God! That is a very big problem!
I will not put you at risk of an infection by Superbugs
Thank you, uncle! Can you pass this message to others also?

Challenges and solutions

Socio-economic differences - addressing the access vs excess conundrum. On one hand India is one of the highest consumers of antibiotics and on the other, access to antibiotics and healthcare in general is lacking in low-resource settings. Students we engaged with came from different socio-economic backgrounds. This difference led to them understanding and relating to the issue of AMR differently. Students in the government school, possibly due to the lack of access to antibiotics and healthcare, related more to the sanitation and hygiene issues related to the AMR problem. On the other hand, students at the private school seemed more well-versed with the biology of AMR and misuse of antibiotics. They also seemed more interested in the science compared to the students at the government school. We had not quite taken these differences into account while preparing for the workshops and had to adapt in real time during the workshop. Even though AMR impacts every section of the society, to mobilise community to take appropriate action, AMR communication and engagement strategy should differ based on which of these groups one is engaging with. This was one of the major lessons for us from the project.

Continuous engagement with schools post-workshops was difficult due to a small team but follow up visits and participation at their events ensured that the issue was not forgotten. We also helped the school plan programmes that they could organise to continue talking about the issue.

Sustainability and Scale up

Design of the program ensures that the dialogue initiated is sustained in the long run by getting the participants invested in the problem by partnering with them in developing innovative tools for further awareness.

From everyday pulses for fun activities to pen and paper for grassroots comics, the program is very cost effective and can be scaled-up and reproduced anywhere. The approach can also easily be adapted to target different audience like pharmacists, patients and the general public.

We plan to widely disseminate the awareness and other educational resource material developed during the pilot. We would also explore if we could assist National education boards to include AMR education in science education curriculum through the lesson plans developed for this program.

In the next phase of the programme, we plan to partner with organisations and individuals working in this space in India and aid government programs that are working towards raising awareness on the issue.

Lessons

There were significant lessons learnt during the project. We have outlined some below:

To ensure sustainability, community (in this case, the students and schools) needs to recognise and own the problem and subsequently the solution Different socio-economic groups would understand and relate to the AMR issue differently. This would apply to other health issues as well.

Public engagement approach and the health communication strategy would and should differ depending on the target audience.

It is important to develop awareness material targeted at the public, in different languages, not just in English so that more people can access the information.

Some other *SaS* highlights

1) *SaS* was featured by WHO during Antibiotic Awareness Week 2018 https://www.who.int/campaigns/world-antibiotic-awareness-week/world-antibiotic-awareness-week-2018/features-from-around-the-world

2) Expert Spotlight: 5 Questions with Superheroes Against Superbugs http://battlesuperbugs.com/node/348

3) *SaS* was selected as one of the two initiatives from around the world working to tackle drug-resistant infections. SaS leads presented the project in Accra, Ghana in November 2018.

4) *SaS* was featured in South African-based Mail & Guardian newspaper in November 2018

SaS team

Leads
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