

# VIEWS AND OPINIONS ON THE IDENTIFICATION OF ANTIBIOTICS AND THE HARMONISATION OF THEIR APPEARANCE

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On behalf of the ABACUS II consortium



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## SUMMARY

Recent evidence suggests confusion among healthcare providers, medicine suppliers and community members regarding how to recognise an antibiotic, in which antibiotics are commonly mistaken for other medicines such as painkillers. The aim of this work was to explore the views and opinions of healthcare providers and (public) health researchers on the identification of antibiotics and the harmonisation of their appearance. A web-based questionnaire was designed and disseminated through the ABACUS II network.

The questionnaire data suggests that about half of healthcare providers, health care researchers and medicine suppliers experienced difficulties in identifying antibiotics and discriminating them from other commonly used medicines. Most participants agreed that standardising the physical appearance of antibiotics could help improve their recognition and benefit patient safety.

The data also suggests that not all prescribers had awareness of how oral antibiotics look like. The data confirms that there was not a specific physical feature that makes it easy to identify antibiotics. From the data, antibiotics came in as many different physical presentations: various colours and sizes being associated with oral antibiotics across different countries. The main physical features used by participants to identify antibiotics at the unit level are the dosage form, pill colour and pill size.

More research using more robust research methods is needed to assess the extent of the problem of antibiotic identification among different stakeholder groups (healthcare providers, medicine suppliers and communities) to identify opportunities for improvement.

## INTRODUCTION

Antimicrobial resistance has been listed in the top 10 global public health threats by the WHO [1], with the highest burden in low-resource health systems [2]. The emergence of AMR brings about several consequences, including antibiotic treatment failure, prolonged illness and hospital stay, higher financial burden, and increased mortality [1]. The main drivers of AMR are the overuse and misuse of antibiotics [1], especially in low-middle-income countries (LMICs) where antibiotics are easily accessed by both healthcare providers (HCPs) and community members.

The AntiBiotic Access and Use (ABACUS) project explored antibiotic uses and access practices across rural communities in six LMICs in Asia and Africa [3,4]. An important ABACUS finding was the confusion among healthcare providers and community members regarding how to recognise an antibiotic and that antibiotics are commonly mistaken for other medicines such as painkillers [3]. For example, communities in Vietnam, Ghana, and Mozambique often associated antibiotics with capsules. This can lead to confusion as many other medicine classes are sold as capsules as well. European studies confirm suboptimal medicine identification and confusion by patients [5-7].

Confusion about antibiotics recognition could be a barrier to effective communications between patients and HCPs about past and current medication use. In addition, it could hinder the impact of responsible antibiotic use initiatives as these will not work optimally if the medicine cannot be recognised easily and linked to the public health messages.

The ABACUS II project (2020-2023) aimed to investigate the idea of improving the identification of antibiotics to facilitate identification for healthcare providers and community.

**The aim of this work was to explore the views and opinions of healthcare providers and (public) health researchers on the identification of antibiotics and the harmonisation of their appearance.**

## METHOD

- A web-based questionnaire was designed to explore the views and opinions of stakeholders besides community members on the identification of antibiotics and the harmonisation of their appearance. The questionnaire was designed to take about 5 min to fill in and contained both closed and open questions (Appendix 1). The choice for this pragmatic study design should be considered in the context of the first month of the SARS-CoV-2 pandemic in 2020.
- A brief questionnaire was designed in English in SurveyMonkey (Palo Alto, United-States) and consisted of several topics. First, some basic demographic data was collected. Other topics included whether participants experience difficulties in recognising and discriminating antibiotics from other oral drugs. Also, specific physical appearance features associated with antibiotics (e.g., specific shape, colour, size or packaging) were explored. Finally, participants were asked whether introducing a standardised appearance of oral antibiotics would enable better recognition and prescription by health care providers, facilitate appropriate antibiotic use, and improve patient safety. An overview of the questionnaire questions is shown in Appendix 1.
- The questionnaire was disseminated by email and social media (e.g., linked in and twitter) through the international network of the ABACUS II researchers. The questionnaire was also shared to members of the ESCMID Study Group for Antibiotic Policies (ESGAP), the International Society of Antimicrobial Chemotherapy and The French Infectious Diseases Society (SPILF).
- The data was collected in September and October 2020.
- All participants were informed about the aim of the study and the purpose of data collection. Formal ethical approval from a medical ethical committee was not required for this research in the Netherlands since it did not subject participants to any medical treatment or impose any specific rules of conduct on participants.
- Questionnaire data were analysed using descriptive statistics and thematic analysis was applied to the answers of the open questions. Incomplete questionnaires were excluded.

## RESULTS

### DEMOGRAPHIC DATA

- In total, there were 247 participants. More than half of them were healthcare professionals that prescribe medicine (52.6%), followed by health researchers (29.6%), suppliers or sellers of medicine (6.5%), healthcare professionals that do not prescribe medicine (6.9%), and others (incl. managers working in healthcare and staff members of public health and/or regulatory agencies) (4.4%). More details are shown in Appendix 2.
- One half of the participants came from high-income countries (50.4%) and the other half form low-to-middle-income countries (49.6%).

Participants experienced more difficulties in recognising and identifying the individual dosage form (48%) than the packaging (38%) of antibiotics from other medicines (Figure 1).

### IDENTIFICATION OF ANTIBIOTICS

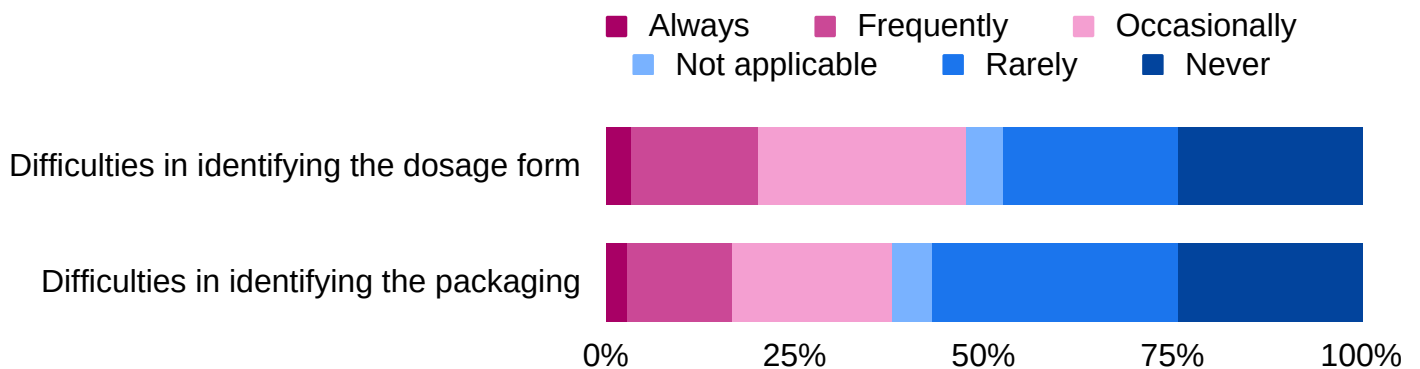
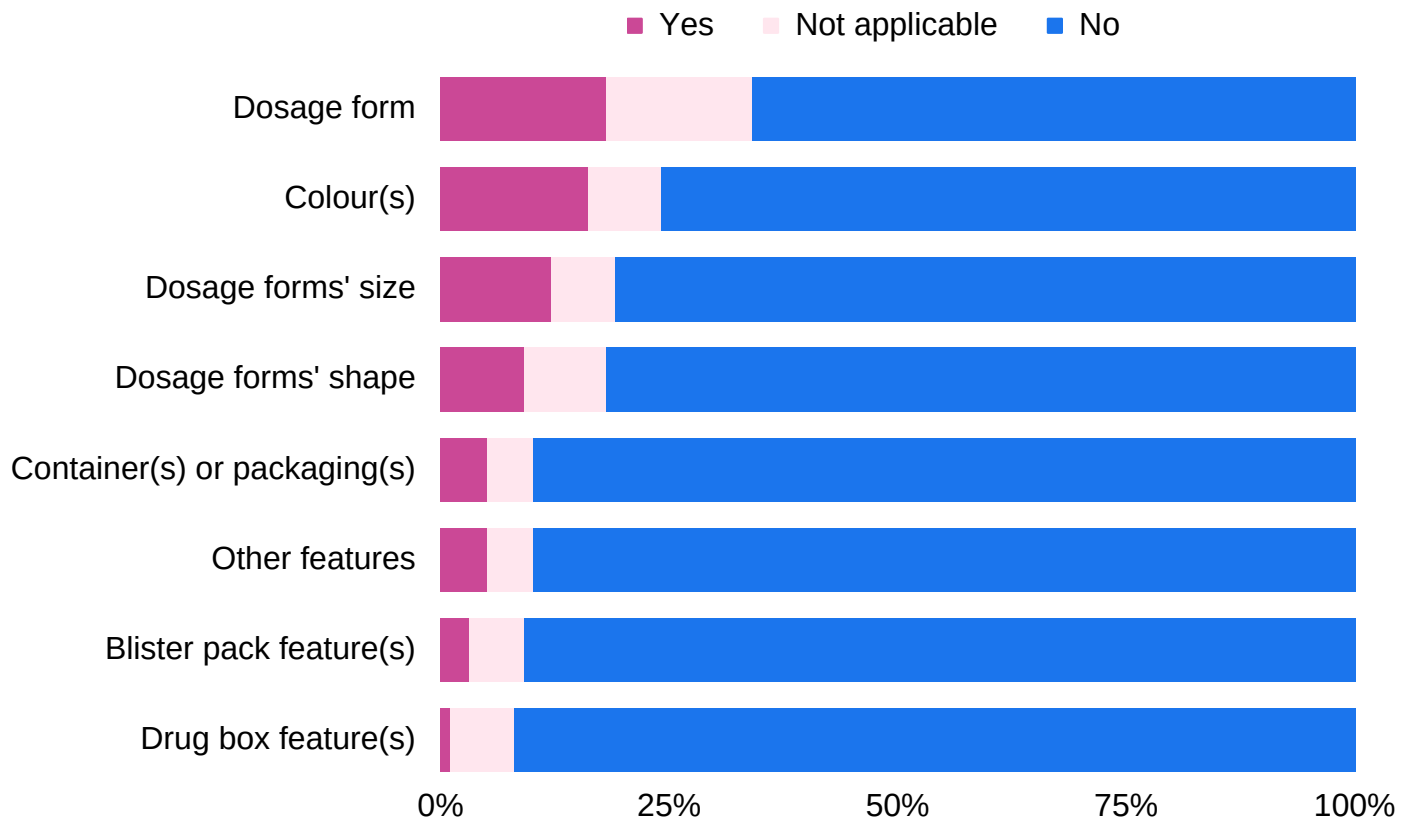


Figure 1 | Experience with recognising and identifying oral antibiotics

## RESULTS

The most frequently reported physical feature which was used to identify medicine was the medicine's dosage form (18%). Twenty-two participants specifically reported associating antibiotics with capsules and 15 participants with tablets. Next, colour(s) or colour combinations (16%), size (12%) and shape of the dosage form (9%) were also associated with oral antibiotics (Figure 2).

## IDENTIFICATION OF ANTIBIOTICS (CONTINUED)



**Figure 2 | Physical appearance features frequently associated with oral antibiotics**

Interestingly, multiples colours were associated by participants with oral antibiotics across different parts of the world. Both a single colour and a broad scale of combinations of two colours were reported by participants (Table 1).

## RESULTS

The most frequently associated colours were white tablets and yellow-red capsules. One active pharmaceutical ingredient (API) was reported to be available in different colours and colours combinations: ampicillin cloxacillin capsules are available in black-purple in Nigeria and yellow-red in South Africa; amoxicillin is available in black-pink capsules in Myanmar and yellow-red in Mozambique.

### IDENTIFICATION OF ANTIBIOTICS (CONTINUED)

**Table 1| Overview of colours or combination of colours that participants associated with oral antibiotics**

Associated colors	Specific Active Pharmaceutical Ingredient (API) are specified when reported by the participants
<b>Single color</b>	
White	metronidazole (South Africa), azitromicin (Mozambique)
Yellow	metronidazole (South Africa, Mozambique)
Red	rifampicin (France)
Purple/violet	rifadine (France), clindamycin (France)
Green	doxycycline (United Republic of Tanzania)
Blue	azithromycin (Slovenia)
<b>Combination of colors</b>	
Black-purple	ampicillin, cloxacillin (Nigeria)
Black-green	librium (Ghana)
Black-pink	flumox (Myanmar)
Blue-green	---
Yellow-blue	---
Yellow-red	tetracycline (Ghana), ampiclox (South Africa), amoxicillin (Mozambique)
Yellow-green	tetracyclin (South Africa)

## RESULTS

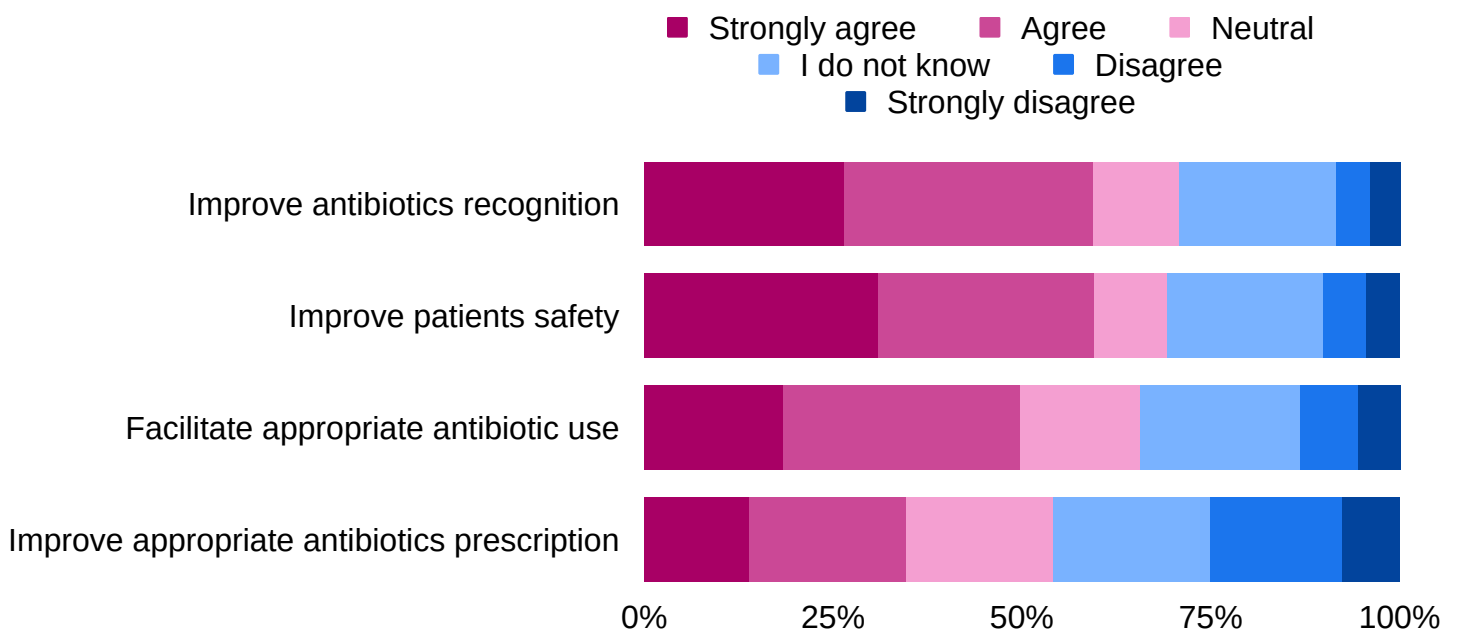
**Table 1 (continued)**

Associated colors	Specific Active Pharmaceutical Ingredient (API) are specified when reported by the participants
Red-white	---
Red-black	ampicillin (Ghana)
Red-blue	---

Legend: "---" not specified

### STANDARDISATION OF APPEARANCE OF ANTIBIOTICS

About 70% participants (strongly) agreed that a standardised appearance of antibiotics should improve their recognition and patient safety. About two thirds of the respondents (strongly) agreed that a standardised appearance of antibiotics would improve appropriate antibiotic use and about half agreed that it could also improve antibiotic prescription.



**Figure 3 | Opinions on the benefits of a standardise appearance of oral antibiotics**



## RESULTS

### STANDARDISATION OF APPEARANCE OF ANTIBIOTICS (CONTINUED)

- Participants shared their opinions on the idea of improving the identification of antibiotics by introducing a system to standardise their appearance. Several participants were in favour of such approach while others warned for some potential challenges. Illustrative quotes are shown in Table 2.
- Participants had different views on the ways forward for an identification system. Certain participants favoured an approach focusing on the individual dosage form, whereas others focused on the packaging. For instance, on the individual dosage forms or pill level, suggestions for a universal colour coding system, a universal imprint code to be stamped on the pills, or writing dosage on the pills were made. Proposals for a standardised packaging included inserting a warning message on the packaging or imprinting a special sign for antibiotics.
- Participants also highlighted the need to address responsible medicine use (incl. education and training, clear instruction on usage) and responsible dispensing practices aspects (incl. education and training of dispensers, dispensing the exact number of pills and separate dispensing of antibiotics from other medicines) into account.
- Interestingly, several participants highlighted the lack of awareness of the physical appearance of antibiotics in prescribers.

## RESULTS

**Table 2 | Quotes extracted from participant's answers to open ended questions in on the topic of standardising the appearance of oral antibiotics**

Theme	Quotes
Opinions towards a standardised physical appearance of antibiotics	<p><i>"Harmonisation of antibiotics should be encouraged"</i> – Health researcher, Ghana</p> <p><i>"Appearance of oral antibiotics should be different than other medicines"</i> – Health researcher, Bangladesh</p> <p><i>"I suggest the harmonisation of oral antibiotic based on the recent evidence published (community knowledge and awareness of antibiotics) on LMIC"</i> – Health researcher, Mozambique</p> <p><i>"Litigation could be an issue if (e.g. all amoxicillin become yellow-red capsules) as this would be like trying to mimic the appearance of the originator"</i> Non-prescriber, Malta</p>
Suggestions for a standardised physical appearance of antibiotics	<p><i>"Focus should be on the pill itself rather than packaging or blister only due to the fact that in LMIC medications are often sold/provided out of their original packaging"</i> – Supplier/seller of antibiotics, USA</p> <p><i>"I am not sure it is feasible to standardise the appearance of the pills. Including a specific logo for antibiotics on the package and the blister might however be feasible"</i> – Healthcare professional that prescribes medicine, France</p> <p><i>"It should have some special signs imprinted in the box to indicate that the drug is antibiotic and should be used as prescribed by doctors..."</i> – Healthcare professional that does not prescribe medicine, Vietnam</p> <p><i>"Universal colour coding of antibiotics in order to recognise them even if they are not manufactured in the country of use"</i> – Supplier/seller of antibiotics, Nigeria</p> <p><i>"Need universal global imprint code so providers and patients can easily identify pills not just on shape, color, packaging but rather the code stamped on the pill"</i> – Healthcare professional that prescribes medicine, USA</p> <p><i>"Writing dosage on the tablets"</i> – Health researcher, Kenya</p>

## RESULTS

**Table 2 (continued)**

Theme	Quotes
Responsible medicine use practices	<p><i>“Standardised appearance should be accompanied by training and sensitisation on appropriate use”</i> – Health researcher, Mozambique</p> <p><i>“I think that a warning message due to inappropriate use in the packaging mentioning resistance would be a great idea”</i> – Health researcher, Sweden</p> <p><i>“...for the aim of antimicrobial stewardship it is more important to apply a specific sign on the flacon/the package and to include a clear short instruction about the way of usage, the strong necessity to follow the physician' prescription (especially the timely administration); to return to pharmacy the remaining capsules/tablets after the therapy”</i> – Healthcare professional that does not prescribe medicine, Bulgaria</p>
Responsible medicine dispensing practices	<p><i>“The number of pills given to the patient should be exactly the quantity that he needs to complete the prescribed treatment”</i> – Healthcare professional that prescribes medicine, France</p> <p><i>“I think more than just appearance of drugs, prescribers and patients should be educated on proper antibiotic use”</i> – Healthcare professional that prescribes medicine, Slovenia</p> <p><i>“Antibiotics should not be delivered in blisters together with other medicines, but separately, to make identification easier”</i> – Healthcare professional that prescribes medicine, France</p>
Lack of awareness on physical appearance of medicines by healthcare providers	<p><i>“I prescribe antibiotics, but I hardly ever see them”</i> – Healthcare professional that prescribes medicine, France</p> <p><i>“There are too many kinds of antibiotics with different formats that I think no one can know and recognise them all”</i> – Health researcher, Vietnam</p> <p><i>“I hardly ever see the packaging, I prescribe it, but then it is delivered by the pharmacy and the nurses give it to the patient. I usually don't see it”</i> – Healthcare professional that prescribes medicine, the Netherlands</p> <p><i>“Don't see why it [=changing the appearance of antibiotics] would change prescribing behaviour - most people who prescribe have nothing to do with dispensing the medication and couldn't pick an antibiotic out of a line up”</i> – Health researcher, South Africa</p>

## CONCLUSIONS

- This data suggests that about half of healthcare providers, health care researchers and medicine suppliers experience difficulties in identifying antibiotics and discriminating them from other commonly used medicine. Most participants agreed that standardising the physical appearance of antibiotics could help improve their recognition and benefit patient safety. The data also suggest that not all prescribe have awareness of how oral antibiotic look like.
- The data confirms that there is not a specific physical feature that makes it easy to identify antibiotics. The data also suggests that antibiotics come in many different physical presentations with many different colours and sizes being associated with oral antibiotics across different countries.
- The main physical features used by participants to identify antibiotics at the unit level are the dosage form, pill colour and pill size.
- The results of this survey were used to guide stakeholder and expert consultations conducted by the ABACUS II project conducted between 2020 and 2022. Generalisability of the study findings is limited by its pragmatic design. More research using more robust research methods is needed to assess the extent of the problem of antibiotic identification among different stakeholder groups (healthcare providers, medicine suppliers and communities) and identify opportunities for improvement.
- The ABACUS II consortium is conducting an international qualitative study to explore the potential impact of/and obstacles to improving the identification of antibiotics using a physical appearance feature. The study involves individual in-depth interviews and focus group discussions with (formal and informal) medicine dispensers and community members in Africa (South Africa, Ghana, Mozambique) and Asia (Thailand, Vietnam, Bangladesh). Data collection is ongoing, and results are expected later in 2023.

## APPENDICES

### APPENDIX 1: QUESTIONNAIRE DESIGN

The questionnaire was divided into three main parts:

Part 1: Basic demographic data.

Part 2: Identification of oral antibiotics.

- Experience(s) with recognising and identifying antibiotics from other oral medicine.
- Association(s) of specific physical appearance features of antibiotics (e.g., specific shape, color, size or packaging) for identification.

Part 3: Opinions on whether introducing a standardised appearance of oral antibiotics would enable better recognition and prescription.

Demographic data	Percentage
<u>Profession</u>	
Healthcare professional that prescribes medicine	52.6%
Healthcare professional that does not prescribe medicine	6.9%
Health researcher	29.6%
Suppliers or seller of antibiotics	6.5%
Others*	4.4%
<u>Sex</u>	
Female	52.8%
Male	42.7%
<u>Age group</u>	
18-24	1.6%
25-34	40.7%
35-44	27.2%
45-54	17.5%
55-64	8.5%
65+	4.5%
<u>Countries by income level**</u>	
High income	50.4%
Low to middle income	49.6%
<u>Working area</u>	
Urban	77.2%
Suburban	10.2%
Rural	10.6%
Others***	2%

### APPENDIX 2: DEMOGRAPHIC SUMMARY OF THE PARTICIPANTS

\*Other professions included managers working in healthcare (i.e., healthcare provider manager, health information manager) and staff members of public health and/or regulatory agencies (i.e., medicine regulators, regulators affairs, drug quality control tester, surveillance office).

\*\*The classification of countries by income level was based on The World Bank 2021-2022 classification.

\*\*\*Other working area: participant work in more than one the above-mentioned area.

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