# THE ACCESSIBILITY AND AFFORDABILITY OF ORAL MEDICATIONS SPECIFICALLY ANTIBIOTICS FOR TREATING NON-COMMUNICABLE DISEASES: A COMPARATIVE STUDY OF DEVELOPING COUNTRIES

Md. Oly Ullah Chowdhury [1*], Salma Rashid [2], Fatma Magdi [3], Amina Rahat [4], Ahmed Raheem Rayshan [5], Rabia Zulfiqar [6*], Maqsood Ali [7], Manzoor Hussain [8], Tausif Raza [9], Ayesha Pervez [10]

[1*] Assistant Professor, Bangamata Sheikh Fojilatunnesa Mujib Science & Technology University, Jamalpur, Bangladesh

[2] Senior Lecturer, Department of Pharmacology, Women Medical and Dental College Abbottabad, Pakistan

[3] Assistant Professor, RAK Medical and Health Sciences University, United Arab Emirates

[4] Assistant Professor, Department of Food and Nutrition, College of Home Economics, University of Peshawar, Pakistan

[5] Lecturer, Department of Physiology, Pharmacology, and Biochemistry, University of Al-Qadisiyah/Al-Diwaniyah, Iraq

[6*] Oral and Maxillofacial Surgery Department, King Edward Medical University, Mayo Hospital, Lahore, Pakistan

[7] Department of Biochemistry and Molecular Biology, Harbin Medical University, Harbin, China

[8] Abdul Wali Khan University, Mardan, Pakistan

[9] Xiangya School of Public Health, Central South University, No.172, Tongzipo Road, Yuelu District, Changsha City, Hunan Province, China

[10] Assistant Professor, King Faisal University, Hufof, Saudia Arabia

**\*Corresponding authors**
**[1]Md. Oly Ullah Chowdhury**
Assistant Professor,
Bangamata Sheikh Fojilatunnesa Mujib Science & Technology University,
Jamalpur, Bangladesh; olullah@bsfmstu.ac.bd

**[6]Rabia Zulfiqar**
Oral and Maxillofacial Surgery Department,
King Edward Medical University, Mayo Hospital,
Lahore, Pakistan; rabiazulfiqar77@gmail.com

## ABSTRACT

The Sustainable Development Goals of the United Nations include the availability of high-quality, reasonably priced, and safe medications. The current study examined the price and accessibility of thirteen oral drugs, mainly antibiotics against non-communicable diseases, in developing nations to support the tracking of progress towards these goals. As part of a study on the quality of pharmaceuticals, information on the accessibility and availability of these medications was gathered from a variety of locations (including government and private hospitals, clinics, and street vendors) throughout 34 countries in Pakistan, 29 in Egypt, and 27 in Bangladesh. A standardised method created by Health Action International (HAI) and the World Health Organisation (WHO) was used to analyse the data. The study found that the average availability of oral drugs, specifically antibiotics, varied between 70% and 98% across various facility types in both nations, including informal sellers. Three nations exhibited a higher variety in the average availability of drugs against NCDs in the different types of institutions; in Bangladesh, this variation ranged from 11% to 87%. Of particular note is the low availability of oral drugs to prevent non-communicable diseases (35%, 35%, and 11% accessibility in Egypt, Bangladesh, and Pakistan, respectively), particularly in government-run healthcare facilities. The availability of these oral medications in other healthcare facilities is 75% in Egypt, 91% in Bangladesh, and 75% in Egypt. Treatment courses involving five of the seven researched antibiotics could be deemed affordable in proportion to the daily minimum earnings in three countries, but only one of the five investigated drugs

against NCDs could be deemed affordable in each country. In most situations, the government and other healthcare facilities' generic medication selection demonstrated a respectable level of affordability. The affordability and accessibility of drugs against NCDs urgently need to be improved, albeit some positive data on the availability of oral medications, particularly antibiotics, in these nations.

## INTRODUCTION

The World Health Organisation (WHO) reports that millions of people die needlessly from illnesses and ailments every year, even while effective drugs and vaccines are available to treat them [1]. This may also be related to insufficient availability of essential pharmaceuticals. Thus, guaranteeing that everyone has access to safe, effective, high-quality, and fairly priced pharmaceuticals and immunisations is one of the goals of UN Sustainable Development Goal No. 3.8 [2]. Notwithstanding tremendous efforts, access to drugs is still restricted in numerous nations [3, 4]. A 2014 survey with data from 25 low- and middle-income countries found that the public sector's overall median availability of critical medications was 40% [5]. Low availability of essential medications is evident from a recent analysis of thirty surveys by Ewen et al. [6] and a review by Robertson et al. [7], especially when it comes to treating non-communicable illnesses (NCDs). A 2010 study that looked at the availability of five cardiovascular drugs across 36 countries found that the public sector had a mean availability of 26.3% [8]. Although there is still much work to be done, the WHO has set a target of 80% availability for drugs against NCDs by 2025 [9]. Even in cases where necessary pharmaceuticals are accessible, however, not all patients in low- and middle-income countries can afford them. People may cease taking prescriptions due to financial concerns, which exacerbates the country's epidemics [10]. Many of the 36 countries included in the examination of data from 2009 had limited access to affordable treatments for acute as well as chronic illnesses [11]. Treatment strategies for chronic diseases are more costly when combination therapy is required, according to the previously stated 2010 study on cardiovascular drugs [8]. The analysis by Ewen et al. [6] brought even more attention to the reality that very few low- and middle-income countries can afford or obtain the essential drugs needed to prevent NCDs. Medication availability has not been given much thought in surveys conducted thus far in Egypt, Pakistan, or Bangladesh. Preux et al. [12] conducted a brief study to investigate the accessibility of antiepileptic drugs and discovered that 32 out of 33 patients were being treated with a modern antiepileptic drug. However, because hospital pharmacies frequently ran out of supplies, patients were forced to buy medications from private pharmacies and even from unofficial (illegal) vendors. A detrimental aspect of availability was noted by Becker et al. [13]. In Egypt, non-communicable diseases (NCDs) accounted for 84% of all deaths in 2016. Four disease groups—chronic respiratory diseases, cancer, cardiovascular diseases, and diabetes and kidney diseases—accounted for approximately 60% of all deaths, with their respective percentages being 40%, 13%, 4%, and 3% [14]. NCDs are a major cause of death in Bangladesh, accounting for 572,600 deaths in 2016—that is, 67% of all deaths [15]. Over the past 20 years, there has been an increase in the prevalence of NCDs, and this trend is expected to continue as Bangladesh moves through an increasingly advanced stage of epidemiological transition [1]. Bangladesh emerged as a lower-middle-income nation that had seen tremendous economic and urbanization growth in the preceding decades [16]. Many people are living increasingly sedentary lifestyles as a result of these socioeconomic shifts, which are influenced by altered eating patterns, a rise in the supply and demand for unhealthy processed foods, physical inactivity, irregular meal schedules, smoking, and alcohol consumption [17, 18]. Furthermore, the development of NCDs is influenced by metabolic risk factors [19]. Obesity, elevated blood pressure, elevated blood sugar, and elevated cholesterol are the most prevalent metabolic risk factors [5]. When two or more of these variables come together, it is known as the clustering of risk factors and increases the likelihood of acquiring NCDs [12]. As a result, a sizable fraction of Bangladesh's population aged 18 and over suffered from diabetes (9.2%) [15], hypertension (26.2%) [14], and overweight (29.4%) [13]. The weighted pooled

prevalence of CVD was estimated to be 5% in two meta-analyses that included papers up until April 2017 [19], whereas the prevalence of metabolic syndrome and high fasting glucose were found to be 30.0% and 28%, respectively [20]. Diabetes, hypertension, malignancies, mental health issues, rheumatoid arthritis, injuries, and accidents are examples of non-communicable diseases (NCDs) [21]. According to estimates, injuries and NCDs account for 77% of age-standardized fatalities in Pakistan, where they rank among the top 10 causes of morbidity and mortality [22]. Simultaneously, excessive consumption of antibiotics has been extensively documented, frequently linked to acquisition via "drug shops" [23]. While Bangladesh has registered pharmacies, the majority of drugstores are unregulated merchants that sell medications and can be found in even the most distant areas [24]. Between 80% and 90% of drug stores are run without a valid drug licence [25]. Because of their low cost, extended opening hours, and widespread geographic reach, drug stores are said to be the first point of contact preferred by the majority of the population in Bangladesh, filling a significant void in the country's healthcare system [26, 27]. Moreover, the problem lies in figuring out how to lessen the inappropriate use of antibiotics, including substandard medications and inadequate doses [20], in nations like Bangladesh that have a highly pluralistic health system [19] and restricted access to formal healthcare. To do this, we must comprehend the demands and behaviours of each player in the system, including how healthcare accessibility and patient preferences affect the availability of antibiotics. Merely 20% of medications were available in Pakistan overall [28], with non-communicable disease medications being particularly scarce. Notably, Punjab and Sindh, which were also the subjects of an earlier study, had the greatest average availability (35% and 30%, respectively). Pakistan and Bangladesh exhibit distinct political and economic traits: Pakistan has a low gross national income per capita annually, placing it in the lower middle-class category. A total of 37.2% of people live below the poverty line daily. The average lifespan is 67.79 years [17] at birth. Bangladesh is a low-income nation, with a per capita GNI of less than 2.15% USD annually—less than 56% of Pakistan's GNI. Three times as many people as in Pakistan, the majority of the population lives below the poverty level. Nonetheless, it is stated that the life expectancy at birth is comparable to Pakistan's [18]. In the western areas of Bangladesh, Egypt, and the northeastern sections of Pakistan, data on the accessibility and availability of thirteen critical medicines were gathered as part of a study on drug quality. We have presented the findings about the accessibility and cost of medications in government and healthcare facilities, private pharmacies, and unofficial (illegal) vendors in developing nations, even though the laboratory analysis of the gathered pharmaceutical samples is still ongoing.

**MATERIAL AND METHODS**

The study protocol complied with the MEDQUARG criteria [21] and the guidelines for conducting pharmaceutical quality surveys, which were released by the World Health Organisation in 2016 [20]. Five anti-disease medications and seven antibiotics were chosen for the research conducted in Egypt, Bangladesh, and Pakistan. The study was established after getting ethical approval from the institutional review board (KEMU/02202311/CMD). The drugs that were chosen were all included in the essential medicines lists (EML) of the three countries in which they were designated, and our local partners informed us that these lists were regularly consulted by medical professionals. The selection of medicines was also based on the availability of a USP monograph and a thrice monograph, as this study was conducted as part of a larger investigation on the quality of medicines, using data from The Sovereign Fund of Egypt (Healthcare & Pharma Subfund), Investment Corporation of Bangladesh (ICB), and Pakistan Science Foundation (PSF) as well as analysis conducted by the United States Pharmacopoeia (USP). As a result, the medications that were included were amoxicillin, amoxicillin/clavulanic acid, ciprofloxacin, sulfamethoxazole/trimethoprim, metronidazole, doxycycline, metformin, atenolol, furosemide, hydrochlorothiazide, and salbutamol (albuterol). The same medications were chosen for the trial in three developing countries Egypt, Bangladesh, and Pakistan. The antidiabetic medication glibenclamide (glyburide), rather than the hypertension medication atenolol, was collected in Egypt at the request of the local partners. The essential medicine lists (EML) for Egypt, Bangladesh, and Pakistan included all thirteen of the medications. Table 1 displays the desired strength of all the medications

collected. The samples of tablets or capsules were taken. Nine of the chosen medications should be accessible at all three levels of healthcare facilities, per the EML [23], however, doxycycline, furosemide, and hydrochlorothiazide shouldn't be kept on hand at the Health Centre level. The EML of the nations under consideration [22] stipulates that it must carry nine of the thirteen medications covered in our analysis, except atenolol, furosemide, and hydrochlorothiazide. Samples of medications as well as information on accessibility and affordability were gathered from private pharmacies, informal (= illegal) vendors, and governmental and other healthcare facilities. We have selected 29 centres (Government health facilities, other health facilities, pharmacies, and informal vendors) in Egypt, 27 centres in Bangladesh, and 34 centres in Pakistan. Since the local partners in this study worked throughout Sindh, Punjab, Baluchistan, and Khyber Pakhtunkhwa, these four provinces in Pakistan served as the study's locations. Using the Microsoft Excel tool, health zones were randomly chosen. Medicines were first sampled from the Centre Hospital in each of the Pakistani health zones that were chosen. When the Centre Hospital was a government hospital, the closest medical facility in terms of distance, a private pharmacy, and an unofficial medicine vendor were located, and samples of medications were taken from each of these locations. Since the local partners included in this study worked in locations, the study was done in different parts of Egypt and Bangladesh as well. It was possible to receive a list of every medical facility in each region. Using the Excel function, one medical facility centre was chosen at random for each region. Samples were gathered in Egypt, Bangladesh, and Pakistan between August and November of 2023. In both public and private healthcare facilities, the researchers introduced themselves and the study's goal. On the other hand, samples were gathered through the use of mystery shoppers at private pharmacies and black market suppliers of pharmaceuticals. If available, a quantity of up to 100 capsules (minimum 30 tablets or capsules) was purchased for each medication at each sample site. When there were multiple brands of medication available, the least expensive one was bought. When feasible, samples were gathered in their original containers or packing. Prices and amounts of purchased medications were noted on a standardised form at each of the sixty sampling locations. The local staff used a standardised form to record the following information from the label: sample number, brand name, batch number, manufacturing date, and expiry date, name of the manufacturer, international non-proprietary names (INN) of the active pharmaceutical ingredients (APIs), strength, dosage form, and package size. SAS GmbH, Heidelberg, Germany's JMP version 14.2 was used for the statistical computations. A Wilcoxon test was performed to compare the median ratios between the two groups to determine their statistical significance.

**Table 1: The medications utilized in this investigation and the quantity of each at the ideal dosage for one therapy session**

| Oral medications/ International non-proprietary names (INN) | Model disease | Strength (mg/tbl. or cps.) | Dosage regimen (mg/tbl. or cps.) | Treatment duration | Number of tbl. or cps. For one course of treatment |
|---|---|---|---|---|---|
| Amoxicillin/ clavulanic acid | Adult repository infection | 500/125 | 3 | 7 days | 21 |
| Amoxicillin | | 500 | 3 | | 21 |
| Ciprofloxacin | | 500 | 2 | | 14 |
| Doxycycline tbl./cps. [28] | Malaria | 100 | 2 | 10 days | 20 |
| Metronidazole tbl. [28] | Anaerobic infections | 250 | 6 | 7 days | 42 |
| Penicillin V tbl. [28] | Adult repository infection | 250 | 8 | 7 days | 56 |
| Sulfamethoxazole/trimethoprim tbl. [25, 28] | Repository tract infection | 400/80 | 4 | 7 days | 28 |
| Atenolol tbl. [25] | Hypertension | 50 | 1 | 30 days | 30 |
| Furosemide* tbl. [28] | Oedema | 40 | 1 | | 30 |
| Glibenclamide tbl. [25] | Diabetes | 5 | 2 | | 60 |
| Hydrochlorothiazide tbl. [28] | Hypertension | 25 | 1 | | 30 |
| Metformin tbl. [25] | Diabetes | 500 | 3 | | 90 |
| Salbutamol tbl. [28] | Chronic asthma | 2 | 3 | | 90 |

## RESULTS AND DISCUSSION

*Accessibility*

Figures 1a, b, and c show the approximate locations of the regions of Egypt, Bangladesh, and the provinces and health zones of Pakistan where data and samples for this study were collected. A complete list of the medicines purchased at the sites and their characteristics.
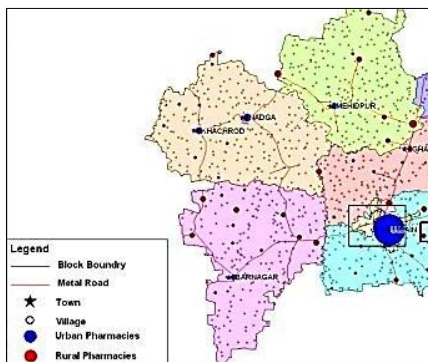


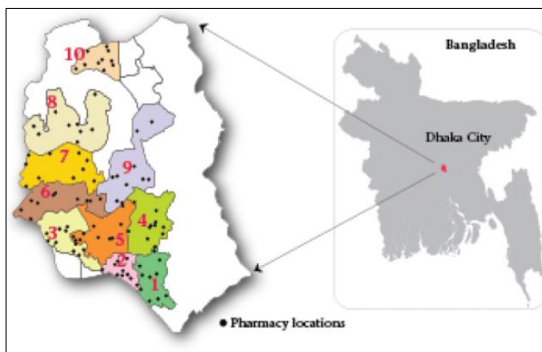**Figure 1 a) Location of Pharmacies (governmental and non-governmental) pharmacies in Egypt**



**Figure 1 b) Location of Pharmacies (governmental and non-governmental) location in Bangladesh**



**Figure 1 c) Location of Pharmacies (governmental and non-governmental) location in Pakistan**

In Table 2, we included only medicines which were comprised in the essential medicines list of these three countries, the full number of the 13 included medicines was only available in 6 of the 29(20.6%) facilities in Egypt and 6 of the 27 (22.2%) facilities in Bangladesh while 12 of 34 (35.2%) in Pakistan. The average accessibility of the 13 medicines was 76.9% in Egypt 71.7% in Bangladesh and 82% in Pakistan (Table 2). Table 2 shows the detailed accessibility results of all investigated medicines in all types of facilities. Notably, government health facilities in the decidedly more affluent Egypt and Bangladesh are not better stocked than in Pakistan (50% average accessibility in these countries). Therefore, the higher overall accessibility of medicines in Egypt and Bangladesh is attributable to the

better stocks of other health facilities, pharmacies and informal vendors in the countries. As expected, private pharmacy shops were better stocked than other types of facilities in these countries. Somewhat unexpectedly, informal vendors in Egypt and Bangladesh were extremely well stocked (78% availability), equal to licensed pharmacies. Figure 2 summarizes and compares the availability of oral medication specifically antibiotics against NCDs in health facilities in Egypt, Bangladesh, and Pakistan. Most striking is the poor accessibility of oral medications against NCDs especially in government health facilities (35%, 35%, and 11% accessibility in Egypt, Bangladesh and Pakistan, respectively). In Egypt, accessibility of these oral medicines in other health facilities reaches 75%, and in Bangladesh reaches 91% and 75%. More details are given below in Figure 2.

**Table 2: Oral Medicine accessibility in the different types of facilities in developing countries (Egypt, Bangladesh and Pakistan)**

| Included Oral Antibiotics | Egypt | | | | | Bangladesh | | | | | Pakistan | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Govt. health facilities (n = 8) | Other health facilities (n = 6) | Pharmacies (n = 9) | Informal vendors (n = 6) | Total (n = 29) | Govt. health facilities (n = 7) | Other health facilities (n = 6) | Pharmacies (n = 8) | Informal vendors (n = 6) | Total (n = 27) | Govt. health facilities (n = 7) | Other health facilities (n = 12) | Pharmacies (n = 8) | Informal vendors (n = 7) | Total (n = 34) |
| Amoxicillin/ clavulanic acid | 6/8 | 3/6 | 7/9 | 3/6 | 19/29 | 6/7 | 3/6 | 6/8 | 5/6 | 20/27 | 7/7 | 10/12 | 6/8 | 7/7 | 30/34 |
| Amoxicillin | 8/8 | 6/6 | 8/9 | 6/6 | 28/29 | 7/7 | 6/6 | 8/8 | 5/6 | 26/27 | 5/7 | 11/12 | 8/8 | 7/7 | 31/34 |
| Ciprofloxacin | 8/8 | 6/6 | 9/9 | 6/6 | 29/29 | 7/7 | 6/6 | 8/8 | 4/6 | 25/27 | 4/7 | 12/12 | 8/8 | 7/7 | 31/34 |
| Doxycycline | 5/8 | 5/6 | 4/9 | 5/6 | 19/29 | 5/7 | 6/6 | 5/8 | 6/6 | 22/27 | 6/7 | 12/12 | 5/8 | 5/7 | 28/34 |
| Metronidazole | 6/8 | 5/6 | 5/9 | 6/6 | 22/29 | 4/7 | 4/6 | 7/8 | 3/6 | 18/27 | 7/7 | 12/12 | 6/8 | 7/7 | 32/34 |
| Penicillin V | 6/8 | 4/6 | 6/9 | 5/6 | 21/29 | 6/7 | 3/6 | 7/8 | 4/6 | 20/27 | 3/7 | 8/12 | 6/8 | 5/7 | 22/34 |
| Sulfamethoxazole/trimethoprim | 8/8 | 6/6 | 9/9 | 6/6 | 29/29 | 7/7 | 3/6 | 8/8 | 6/6 | 24/27 | 7/7 | 7/12 | 8/8 | 4/7 | 26/34 |
| Atenolol | 5/8 | 3/6 | 8/9 | 4/6 | 20/29 | 3/7 | 4/6 | 5/8 | 5/6 | 17/27 | 5/7 | 8/12 | 5/8 | 6/7 | 24/34 |
| Furosemide* | 6/8 | 4/6 | 7/9 | 4/6 | 21/29 | 5/7 | 6/6 | 6/8 | 5/6 | 22/27 | 4/7 | 12/12 | 6/8 | 7/7 | 29/34 |
| Glibenclamide | 4/8 | 6/6 | 7/9 | 6/6 | 23/29 | 2/7 | 5/6 | 4/8 | 4/6 | 15/27 | 6/7 | 10/12 | 4/8 | 5/7 | 25/34 |
| Hydrochlorothiazide | 8/8 | 5/6 | 8/9 | 5/6 | 26/29 | 5/7 | 4/6 | 8/8 | 6/6 | 23/27 | 7/7 | 11/12 | 8/8 | 4/7 | 30/34 |
| Metformin | 7/8 | 4/6 | 9/9 | 4/6 | 24/29 | 7/7 | 3/6 | 7/8 | 3/6 | 20/27 | 3/7 | 10/12 | 7/8 | 3/7 | 23/34 |
| Salbutamol | 6/8 | 3/6 | 7/9 | 3/6 | 19/29 | 7/7 | 3/6 | 6/8 | 4/6 | 20/27 | 7/7 | 09/12 | 6/8 | 6/7 | 28/34 |
| **Average %** | 80.8% | 76.9% | 80.3% | 78.1% | 79% | 78% | 71.7% | 82% | 76.9% | 77% | 76% | 82% | 80.8% | 78% | 79% |
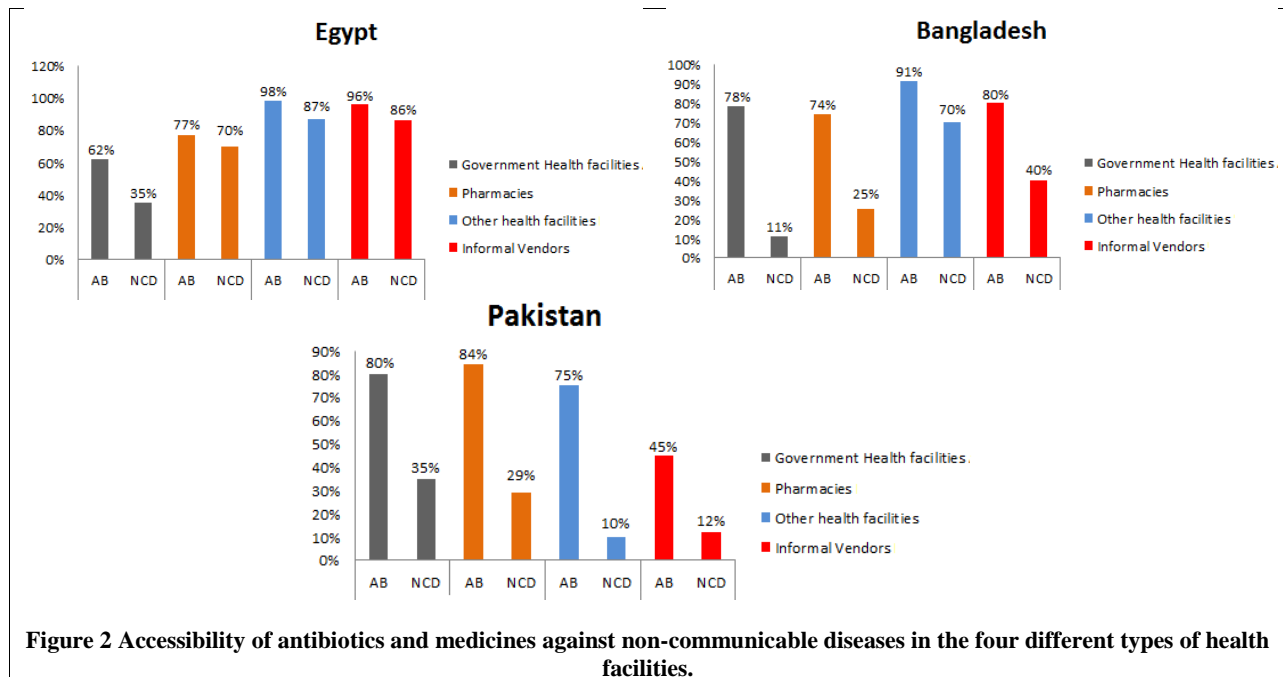


**Figure 2 Accessibility of antibiotics and medicines against non-communicable diseases in the four different types of health facilities.**

*Affordability*

As an indicator of the local affordability of a therapy regimen, the number of days´ wages needed to purchase a course of treatment was calculated following the WHO/HAI methodology [25]. The amount of tablets or capsules required for a course of treatment was calculated as shown in Table 1, Method section. For chronic diseases, the amount of medicine for 30 days of treatment was used [25]. Minimal wages set by the governments of Egypt, Bangladesh, and Pakistan are given by the Country Reports on Human Rights Practices of 2018 [29]. The monthly minimum wage for Egypt was divided by 30 [25], resulting in a daily minimum wage of 2.60 USD. For Bangladesh and Pakistan, we used the minimum daily wage of 2.06 USD which was in effect in January 2023. Figure 3 shows the median number of days´ wages required for treatment with the different medicines investigated. According to WHO/HAI [30], a treatment course is considered unaffordable when it requires more than one day's minimum wage. As graphically illustrated in Figure 3, several of the oral medications specifically antibiotic treatment courses were affordable in these three countries. In contrast, several of the treatments against NCDs were unaffordable, especially the important antidiabetic medicine metformin.
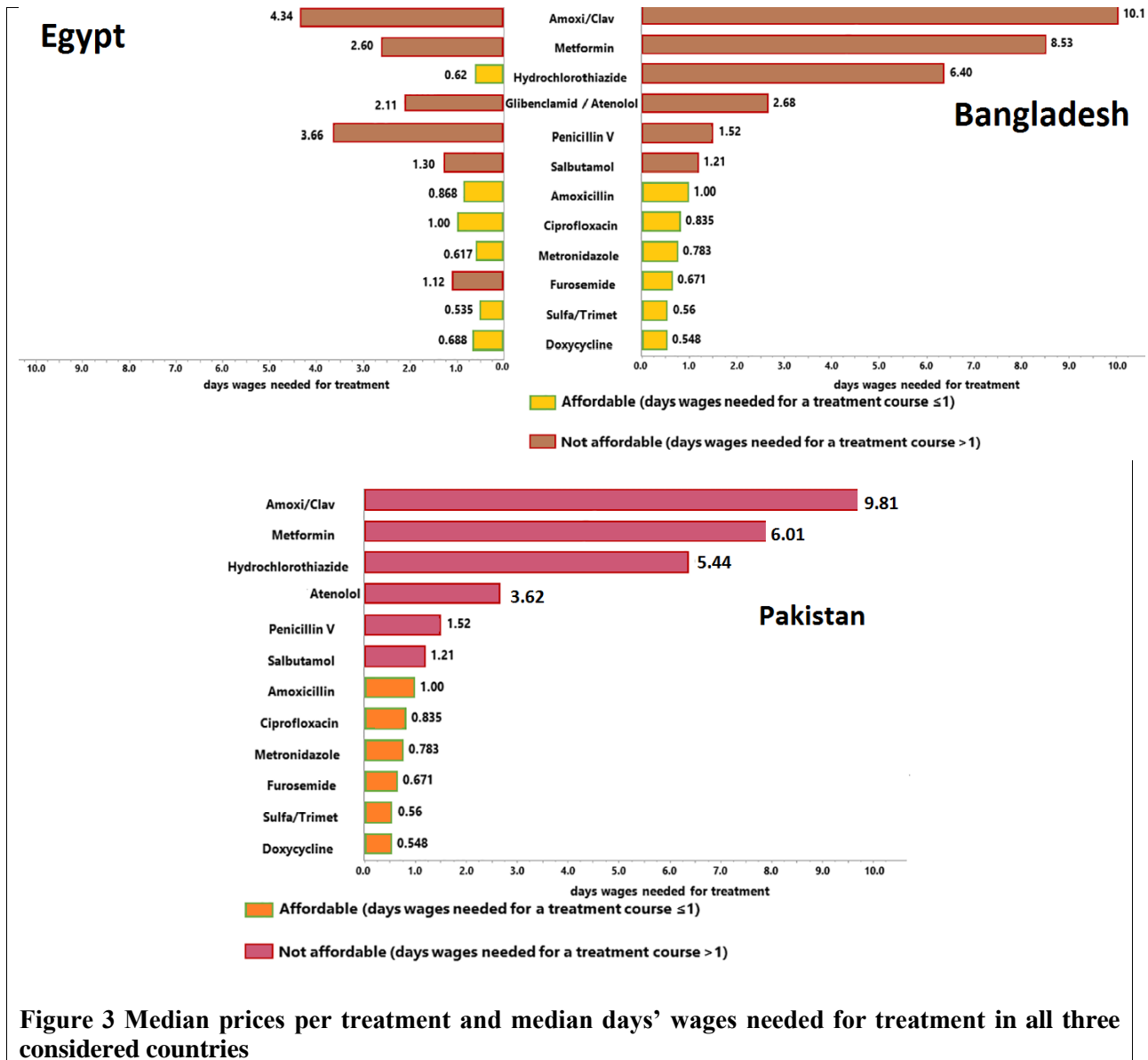


Figure 3 Median prices per treatment and median days' wages needed for treatment in all three considered countries

Using pricing information from medications bought at several random sample locations, this study offers important new information about the availability and cost of necessary medications in developing nations. It indicated an average medication availability of 20% for government and other (or private) health institutions, which is consistent with our findings about the availability of medications against NCDs in different types of institutions (Figure 2). Six first-line ("ACCESS GROUP") and one second-line ("WATCH GROUP") antibiotics in the form of pills or capsules have been investigated in the current investigation [30]. It is noteworthy and encouraging that these antibiotics demonstrated good availability in Bangladeshi healthcare facilities, with the possible exception of the expensive amoxicillin/clavulanic acid combination. This is consistent with the discovery made by O'Connell et al. [15] that first-line anti-malarial medications were readily available in Bangladeshi public health institutions. Pharmacy and unofficial vendors were included in our investigation, which demonstrated that their level of pharmaceutical supply was higher than that of government and other healthcare facilities. This needs to serve as inspiration to enhance availability even further in public and other healthcare settings. To the best of our knowledge, Bangladesh and Pakistan have not yet produced any thorough analyses on the accessibility of medical care. Median pricing ratios in other low- and middle-income nations have been reported to be, on average, 5.3 in the private sector and 3.1 in the public sector [31]. Table 3 shows that, in contrast, the median price ratios in Pakistan and Bangladesh are very low. This suggests that either successful cost-effective procurement occurred, or that drug prices were subsidized, or both. Medication is more inexpensively sold by the government and other healthcare facilities than by unofficial dealers. From the standpoint of public health, this is preferable since it reduces the motivation for patients to purchase from unofficial sellers, where issues with medication quality are likely to arise more frequently. Before the current study, no thorough analysis of the availability of medications in Egypt had been published. It looked into 22 medications for diabetes and cardiovascular disease; four of these (metformin, glibenclamide, furosemide, and hydrochlorothiazide) were also examined in this study. Each of these four medications' overall availability as reported by Jingi et al. [14] is comparable to that found in our analysis for Egypt. Our research, however, indicated reduced availability in government-run medical facilities. This might point to a decline in the availability of medications in government facilities starting in 2012. On the other hand, unofficial sellers easily supplied and offered for sale all examined oral antibiotics, even the pricey amoxicillin/clavulanic acid pills. This is a concerning discovery given the growing threat of rising antibiotic resistance. Notably, the authors indicate greater affordability than our current analysis did for the four medications: metformin, glibenclamide, furosemide, and hydrochlorothiazide. Since these medications were only offered in a small number of government facilities, the majority of the costs in our analysis for these four medications come from pharmacies, other healthcare facilities, and unofficial suppliers, where the cost of the medications is significantly higher than in government facilities. The prevalence of a more affluent middle class that can afford the more expensive medications found in private pharmacy stores may be reflected in the total selection of medications offered by these establishments. Our study's specific cause for concern is the generally poor pricing and accessibility of medications used to treat non-communicable diseases. The WHO Global Status Report on NCDs 2014 [32] highlighted how low- and middle-income nations bear a disproportionately large burden of disease related to NCDs. According to Hunter-Adams et al. [33], there will be a 110% increase in the prevalence of diabetes in Africa by 2035. Tsabang et al.'s study [34] also showed that diabetes and hypertension are becoming more common in emerging nations. Significant changes are required to guarantee that NCD-prevention drugs are accessible and reasonably priced for the general public and that medical personnel are educated in the identification, handling, and therapy of NCDs. Notably, private pharmacies had a good selection of medications against NCDs. The majority of NCD-fighting medications were not very affordable. 2.9 days' salaries in Bangladesh and 2.8 days' wages in Egypt would be required for a 30-day course of metformin therapy. Patients in both nations are required to pay out-of-pocket for a significant portion of medical expenses [35, 36]. Notably, a 2019 survey found that two hospitals' diabetic patients' non-adherence to treatment was largely caused by the high cost of medications [37]. As previously noted by Wirtz et al. [38], this emphasises the significance of making vital medications affordable as a top priority in obtaining universal health care. The most costly

medications in our analysis were original manufacturers, mostly found in Europe. The only places to get hydrochlorothiazide were private pharmacies, where it cost an astounding 53 times more than the MSH reference amount. Because of this, people might purchase hydrochlorothiazide from unreliable suppliers, resulting in the use of potentially dangerous medications. Since this study was a component of a medicine quality investigation, data collection and analysis were not done by the WHO/HAI approach [25]. As recommended by the WHO/HAI approach [25], we did not request the lowest-priced originator and generic for every medication in every sample site; instead, we gathered the cost of the least expensive brand for each of the 13 brands that were requested for each of the sampling sites. Moreover, the majority of our sampling locations were found in big or small towns, thus it's possible that our poll does not accurately represent the circumstances facing the rural populace. The results do not apply to other therapy classes like antiretrovirals or cytostatics because the medications chosen were antibiotics, cardiovascular drugs, and antidiabetics. The accessibility and affordability of medications were only examined once in this study and therefore do not account for changes over time. So far, data analysis has only been done using descriptive statistics methods. The writers are conducting more research on the accessibility and calibre of medications, and after these investigations are finished, they plan to provide more data analysis.

## CONCLUSION

Pakistan, Bangladesh, and Egypt have lower average medication availability than the WHO target of 80%. Antibiotics are widely available in the private sector, but in these nations, the public health system's supply of medications needs to be improved. More advancement is required in terms of affordability, at least for a few of the medications under investigation. This is especially important to guarantee accessibility and affordability for medications used to treat non-communicable diseases.

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