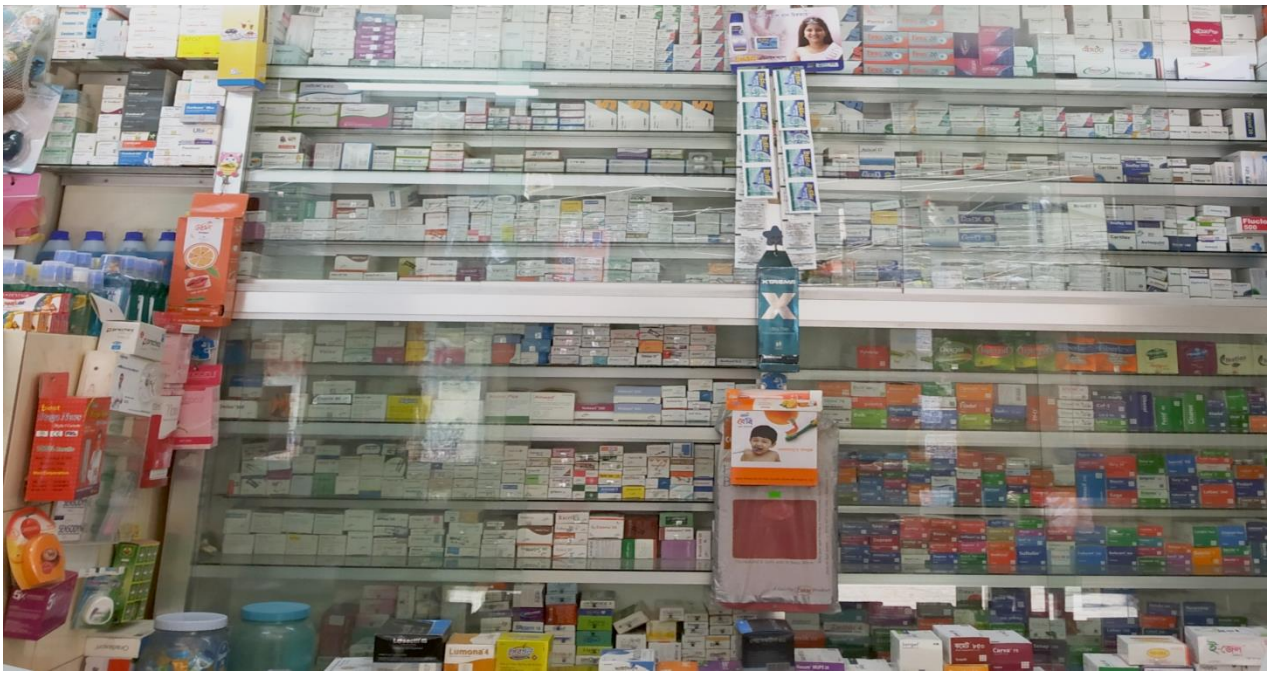
Newaz Md. Shah

Pharmacists' perception of their challenges at work, focusing on antimicrobial resistance; a qualitative study from Bangladesh



Master's thesis in Global Health

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Trondheim May 2019

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Declaration

I, Newaz Md. Shah, the author of this work, do hereby declare that except for references to literature and works of other researchers, which have been duly cited, this thesis is my own work and it has not been submitted anywhere.

Trondheim 27 May 2019

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1 ABSTRACT

Background Antimicrobial Resistance (AMR) is one of the major global health problems. The indiscriminate use of antimicrobial medicines has led to the development of resistance among various microorganisms. The growing resistance compromises the effectiveness of medicines and the WHO declared that controlling AMR is a top priority for global health. Bangladesh is a low-middle-income country, but despite the improved healthcare indicators, infectious diseases remain a prioritized public health problem. Shortage of physicians within the country, force patients to look for healthcare services from facilities without the supervision of qualified medical personnel, including retail pharmacists.

Method A qualitative study design was employed to explore retail pharmacist's perceptions and awareness regarding AMR, their challenges at work and their preference for antimicrobial medicine when used for patient's treatment.

Findings Twenty-four individual interviews of retail pharmacists in Bangladesh were conducted. The retail pharmacists described their motivations and challenges in their profession. They demonstrated a wide range of knowledge and concerns regarding AMR in Bangladesh. According to them, broad-spectrum antibiotics are frequently used, despite being a well-known cause for AMR. Old prescriptions, self-medication, lack of regulations and the easy availability of antimicrobial medications, were key factors which contribute to the misuse of antimicrobial treatment, found in the study. The pharmacists meant that these issues need to be addressed properly to control the AMR situation.

Conclusion Knowledge and practice gaps among retail pharmacists and patients were identified in this study. Although, the pharmacists understood the reasons of the development of AMR, a need to understand the long-term impact is essential. Introducing proper knowledge of AMR in the pharmacists' education, need to balance information provided by the pharmaceutical representatives and Internet, and this would be beneficial to control AMR. Innovative programs like 'Model Pharmacy' should be introduced to raise awareness in society.

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Md. Shah Newaz

3 ABBREVIATIONS

AMR – Antimicrobial Resistance

DALYs – Disability Adjusted Life Years

GDP – Gross Domestic Product

LMIC – Low and Middle Income Countries

NGO – Non-Governmental Organization

OOPs – Out Of Pocket payments

SDG – Sustainable Development Goals

SEA – South East Asia

USD – United States Dollar

WHO – World Health Organization

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4 BACKGROUND

4.1 UNDERSTANDING ANTIMICROBIAL RESISTANCE

Antimicrobial is a chemical substance and it has distinct chemical and biological properties which make it ideal agents to work against infectious disease (1).

Antimicrobial resistance (AMR) is when microorganism able to survive and reproduce in the presence of an antimicrobial medicine (2). AMR is generally known as drug resistance (3). Clinicians, researchers, and health professional have identified AMR as one of the greatest challenges of global public health (4). Development of AMR is a natural process but there are various factors contributing to the development of resistance among microorganisms (4-6). Drug resistance was first recognized in the early 1940s after the discovery of the first antimicrobial agent, and despite many organizations' effort, the problem continues to evolve faster than the previous decade (7).

4.2 IMPACT OF ANTIMICROBIAL RESISTANCE

AMR has appeared as one of the major global health problems of the 21st century and threatens the effective prevention and treatment against infectious diseases caused by bacteria, parasites, viruses, and fungi, which become less susceptible to the common medicines that are used to treat them effectively (8). Excessive and inappropriate use of antimicrobial is considered as one of the most important causes for the development of AMR (9-11). Due to AMR, the first line of antimicrobial medicine loses its effectiveness against infection problem, patients need to move towards the second or third line of medicine which are three to 18 times more expensive and showing more side effects, and even these medicines do not show expected results (12-14). Without effective antimicrobial medicine, various medical treatments like cancer chemotherapy, major surgery, organ transplant, and diabetes management may become less successful and the situation will lead to increased disease burden and high medical expenditure for the long term (12-14). The antimicrobial resistance is putting the gain of the millennium development goals at risk and endangers the objectives of the Sustainable Development Goals (SDG) (5, 8). That is why controlling antimicrobial resistance is one of the top priorities for the World Health Organization (WHO) (12).

According to the WHO, AMR causes 700,000 deaths annually around the world. The death toll will increase sharply in the coming decades, and it could reach up to 10 million deaths per year by 2050, staggering one person will pass-away in every three seconds (8, 14, 15). By 2050, AMR will be responsible for most deaths compared to other leading causes like cancer (8.2 million), diabetes (1.5 million), road accidents (1.2 million), if AMR progresses at the current rate (15).

AMR not only impacts public health, but also creates long-lasting impact over global economy by reducing the effectiveness of medication, resulting chronic illness and increased cost for treatment (16). If the situation is not reversed and no new antimicrobial treatment discovered, to control resistant infections, by 2050 the world will suffer around 100 trillion USD economic loss due to AMR, based on World Bank group prediction (5, 17). People living under poverty around and in Low and Middle Income Countries (LMIC) are expected to be hit hardest (17). By 2050, the world will suffer 2 to 3.8% global Gross Domestic Product (GDP) loss, but it could exceed to 5% for a low-income country (17). This condition could push up to 28 million people towards poverty and that will make it hard to reach the SDG goals to eliminate extreme poverty by 2030 (6, 8, 17).

AMR also affects animals and agriculture development. In many places, antimicrobial medicine is overused for agricultural purpose without professional oversight (14, 18). It is predicted that by 2050, there is a possibility of decrease in global agriculture production by 7.5%, and creating a food scarcity for the growing population (17). Antimicrobial medicine used in agriculture field finds a way in the human body as a portion of food, which has the potential to develop AMR (14, 19).

Insufficient investment in public healthcare in many countries makes it hard to track and control the misuse of antimicrobial medicine. There is a clear relationship between the amount of antimicrobial medicines used and the development of microbial resistance (19-21). Resistance against commonly used antimicrobial drugs is remarkably high in countries where those are not restricted for use (21). WHO reports that in LMIC, prescribers have a lack of knowledge on the proper use of antimicrobial and around 80% of medicines are used for out-patients rather than in hospitals (12, 22, 23). A study done by Proceedings of the National Academy of Sciences , shows that consumption of antimicrobial medicine increased 65% for last the 15 years and it is projected to grow another 200% by the end of 2030, which is driven by the misuse of antimicrobial medicine in LMIC, based on the sales data for 76 countries (17, 24).

Poor hygiene and malnutrition lead to increased transmission of resistant strains of microorganisms from one patient to another with a high density of residence in LMIC (10, 25). The spread of resistant microorganisms among humans mostly occurred in the community rather than healthcare facilities (8, 11). Though some LMIC has prescribing guidelines for antimicrobial; a large number of prescribers do not follow it due to various factors such as, receiving economic incentives from pharmaceutical companies, fear of poor health outcome, and the desire to meet the patient's demand (26).

The overall risk of emergence and spread of AMR in South East Asia (SEA) is the highest among the other WHO regions (12). Poor implementation of regulations, lack of qualified healthcare staff, insufficient health education, self-medication and inappropriate prescribing contributed to the rise and spared of AMR in these countries. Each year, approximately 14 million deaths occur in SEA, among these 6 million or 40% are due to infectious diseases and it contributes to 42% of the total disability-adjusted life years (DALYs) lost (12, 27, 28).

4.3 World Health Organization Response for Antimicrobial Resistance

World Health Organization (WHO) is the responsible technical organization that acknowledged AMR as a global public health problem for the last 60 years (13, 14, 29). The organization was encouraging its member states to introduce essential healthcare policies for rational use of medicines and also emphasizing a number of factors to contain the spared of resistance strain of microorganisms (5, 13).

WHO continually raise the agenda to control AMR in various world health assembly, including 2001, 2008 and 2010 (7, 13, 14). By 2013, WHO developed the draft action agenda to control AMR based on a survey performed in 133 countries (5). During the survey, WHO reviewed the practices for antimicrobial medicine of the member states and built a set of recommendations. By 2015, WHO approved a global action plan to combat against AMR with five main objectives (14); among them, WHO gives priority to buildup awareness among people, improve the surveillance, optimize the use of antimicrobial and sustainable investment for new medicine and diagnosis tools for fast and accurate identification of infectious diseases (12, 14).

Despite various efforts, WHO is unable to comprehend the whole situation in SEA due to weak surveillance systems at place and circumstance makes it difficult to estimate the extent of AMR over the region (25). Bangladesh is one of the 11 countries in the WHO SEAR (World Health Organization, South-East Asia Region) (12, 25).

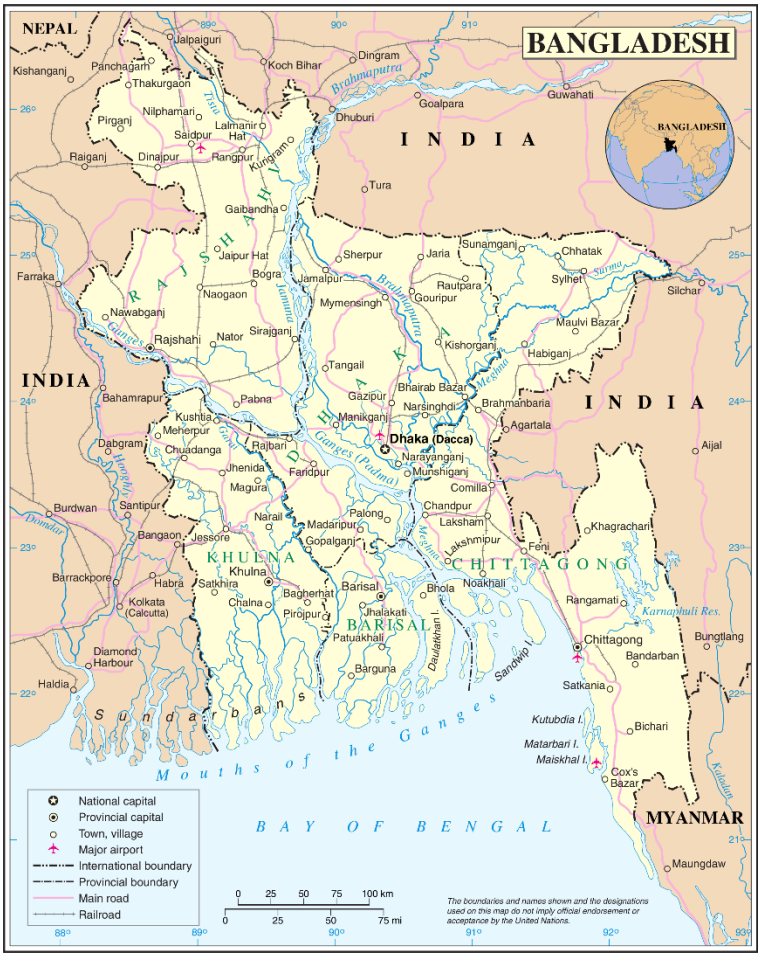

Figure 1 Map of Bangladesh

4.4 COUNTRY PROFILE: BANGLADESH

Bangladesh is a low middle-income country situated in South Asia, surrounded by India and Myanmar with an estimated size of 148,460 square kilometer (30). Modern Bangladesh has emerged as an independent nation in 1971 with tumultuous health and economy and at that time average life expectancy was 47 years (31, 32). But, four decades later of independence, the country has achieved unprecedented progress in several health indicators, including reduced maternal and child morbidity and mortality, high vaccination coverage and increased life expectancy rose to 71 years (32-34).

Bangladesh with estimated total population of 162.5 million with a density of 1077 inhabitants per square kilometer (35). Currently, the country is undergoing economic transition from low-income country to middle-income country, thus a rapid urbanization is been taking place (35). Previously, more than 60% people lived in the rural area and rest in the urban area, but by the 2030 situation will be reversed where more than 60% will live in the urban area (35). This indicates that the annual growth for the city population is about 3.4%, whereas the average population growth for the whole nation is 1.2% (35).

It is estimated the total population in the capital and biggest city of the country, Dhaka is around 18 million (33). Due to the rapid urbanization, most of the migrating rural people end up in the city slums and make it one of the densely populated areas in the country with an estimated population of 205,415 per square kilometer, which is almost 300 times denser than the rural averages (35). In the slums, low levels of hygiene and sanitation contribute to a high prevalence of the infectious diseases. People in the slums are mostly uneducated and involved with laborious work (26), which make them a vulnerable group of population in the country in terms of looking for health care services that they need (36). Due to absence of proper education and financial capacity, they go to the local pharmacists or street vendors for their health checkups (30, 32, 36). Though the local government has been providing primary health-care services to poor people, it has been unable to meet all their needs and demands adequately (35, 36).

Health and education sector of the country are underfunded compared to the other neighboring countries. The government spends about 2.6% and 2.5% of the total GDP in the health and education sector respectively (36, 37). Due to the shortage of governmental funding, the Bangladeshi people depend on out-of-pocket (OOP) payments, which is the main source of healthcare spending (38), and 64% of the total healthcare expenditure is estimated to come from OOPs. This is twice the global standard figure of OPPs and a large proportion of OPPs is spent on medicines (38, 39). Limited access to health insurance or no insurance for ordinary people and unexpected high OOPs payments trigger asset depletion, indebtedness, and prevent people to look for necessary health care services when needed (36, 39). An estimation shows that the poverty rate increases by 3% per year due to high OOP expenditure (39). A study shows that due to the inability to the cover the medical expenses, 38% of people in Bangladesh do not seek treatment despite sickness (38). People who are unable to afford healthcare expenses try to remain without treatment or they look for treatment from the unqualified personnel (40). The existence of unqualified healthcare providers is deeply rooted in the local culture and serve as a bridge between the community and the health care services, especially for underprivileged people (39, 40).

Like all other countries, the pharmaceutical industry is a vital part of the healthcare sector and without them, countries would be unable to achieve their goal against the health-related problem. In Bangladesh, the National Drug Policy was in 1982 instrumental in improving the supply of essential medicines at an affordable price, while maintaining global standard and it triggered the

development of the local pharmaceutical companies, which produced an overflow of the generic medicine production within the country (41-43).

4.5 ANTIMICROBIAL RESISTANCE SCENARIOS IN BANGLADESH

After independence, the country has initiated various policies to improve the healthcare system but within the policy, there was nothing mentioned about the AMR issue (44). A number of research projects have been conducted in Bangladesh to identify the extent of AMR. According to a study done by a Dhaka-based green Non-Governmental Organization (NGO), it was found that 56% of antimicrobial medicine prescribed for patients in the capital, was not working properly against the existing infectious disease (44, 45). The results reveal that common microorganisms already have developed resistance against a number of antimicrobial medicines. Another study uncovered that around 78% of the gut bacteria are resistant to multiple antimicrobial drugs and among them, E. coli was predominant (46). E. coli showing resistant to some commonly used antimicrobial agents e.g. erythromycin (97%), followed by tetracycline (71%), ampicillin (67%), azithromycin (54%), and cefixime (44%) (46). Due to the lack of awareness, both prescribers and patients often prefer antimicrobial medicines for infectious diseases, which could be easily treatable by general medicine; which resulting in antimicrobial turning into a silent killer (47). Another reason for medicine abuse is due to the poor interaction between physicians and patients and very short meetings of 54 seconds on average in a Bangladeshi study (48). Another study showed that physicians with an average of 11 years of experience liked to prescribe antimicrobial medicine in 60% cases based on the symptoms of the patients, rather than the microbial sensitivity test (48). The culture test for microbial sensitivity is not available in many areas and in some cases, it becomes too expensive for patients to bear during the treatment (6). Multiple antimicrobial medicines are prescribed for patients with infectious conditions by physicians in 25.4% of all cases (6), and 48% of antimicrobial medicines are purchased for a single day's dose, and both these cases lead to abuse of medicine (49, 50).

Children are the ones who are the most affected by inappropriate antimicrobial medicine prescribing within the country. One study showed that children under 2 years old consume more than 10 courses of antimicrobial medicine per year on an average which is worryingly high compared to global standards (6).

In Bangladesh self-medication is a continuous problem. Due to the easy excess to the medicine and lack of proper knowledge, people prefer self-medication (31). Due to the inadequate policies and monitoring system, in Bangladesh a wide range of medicines are available, which are legally available with a prescription (51). It was found that, the people from Bangladesh (22.5%) has more tendency for self-medication than India (18%), Vietnam (12%) (52), and the highest purchased self-medicated antimicrobial medicine were metronidazole (50.4%) followed by azithromycin (20.8%), ciprofloxacin (11.5%), cefixime (10.4%) and tetracycline (7.5%) (53).

4.6 RETAIL PHARMACISTS CONTRIBUTION TO SOCIETY

Bangladesh is one of the 58 crisis countries facing health care personal deficiency declared by WHO, however this situation has given little importance in national health policies (40). The number of qualified physicians and nurses available is 52 and 73 respectively for per 100,000 populations, which is low compared to other LMIC (40, 54). A large percentage of people live in the unplanned urban and rural area, where affordable primary care and healthcare personnel are most scarce and thus, patients move go to the 'village doctors' or pharmacists looking for treatment (54, 55). There were around 120 so-called 'village doctors', without medical education and 110 salespeople at retail drug outlets providing treatment per 100,000 population, which makes it about 2.5 times more 'village doctors' and 2 times more pharmacist than physicians (40, 54-56). At the same time, getting in touch with the retail pharmacist is more convenient, time-saving and cheaper than a doctor's consultation (57). Also, retail pharmacy operates for long hours, sometimes they offer medicines on credit for patient's needs (54). It has been found that for their healthcare, people choose the government healthcare provider, private healthcare provider, and pharmacy 11%, 30% and 47% of the time respectively (58). The pharmacist also provides additional healthcare services besides selling medicine like - pushing injections (60%), wound dressings (63%), and vaccinations (31%); all of which are not approved by the country health policy (59).

There are approximately 300,000 to 400,000 retail drug shops present in all around the country, but the majority doesn't have proper drug licenses or training about the profession (59). To simplify the situation, more than 58.7% of pharmacies are operating without a valid license, 54% of medicine sellers do not have any formal education, and 61.9% have never had any kind of training before they join the profession (31). The majority of retail pharmacists learn about their

profession while they are working under physicians (40%), or learn from senior pharmacists (38%) of the establishment (54).

4.7 EDUCATION OF PHARMACISTS

Pharmacy Council of Bangladesh is the monitoring authority of pharmacy education and practice within the country. Students who complete their bachelor in pharmacy program awarded with 'A' grade certification, and those who complete a two years diploma and three months certificate course awarded with 'B' and 'C' grade registration respectively (60, 61). 'A' grade pharmacists are allowed to work in pharmaceutical industries, and 'B' grade pharmacists mostly work as technical personnel in hospitals (60, 61). 'C' grade and untrained pharmacists work in retail pharmacies (61).

4.8 HOPE IS NOT LOST: ENLISTED OF 'MODEL PHARMACY'

The Bangladesh government took part in the WHO global action plan for AMR as a member state of the UN. Though currently, AMR incidences data were unavailable for 58 out of the 64 districts of Bangladesh, and to improve the surveillance for antimicrobial consumption thorough-out the country, the government has started various policies among those, the 'Model Pharmacy' program is highlighted (41, 62, 63). The government understands that by regulating the practice of pharmacists and the distribution of drugs, it would able to control of misuse of medicines. The 'Model Pharmacy' program is a public-private partnership program and encourages other grades of pharmacists to join the retail pharmacy profession. During the program, the government certifies and promotes the private pharmacy shops while shops provide better pharmaceutical services to the residents of the area. The facility of 'Model Pharmacy' is divided into two categories Level-1 and Level-2 based on size of the area it represents, a qualification of the pharmacist working in the shop and the service it provides to the patients (59).

The initiative of the 'Model Pharmacy' program started in late 2016 and government hoped that by later years, it would able to engage at least 150 'A grade' pharmacists and 2000 'B grade' pharmacists in the program and it would gradually spread around the country (64).

4.9 RATIONALITY OF STUDY

The first objective of the global action plan on AMR by WHO, is to avoid the overuse of antimicrobial treatment, which requires healthcare professionals' awareness and understanding about AMR by effective communication with patients (12, 65, 66). Patients' health education is an important component to fight against AMR and pharmacists may play a leading role in changing behaviors of patients with their comprehensive knowledge to build up awareness about safe and appropriate medication practice (67-69). Studies from high income countries show that advice and clinical role the qualified pharmacists can ensure optimal use of antimicrobial medicines (65, 70). However, there are relatively few studies on the role of the pharmacists in controlling AMR in LMIC (12, 65, 66, 71).

Therefore, the aim of this study is to investigate the pharmacist's experience with antimicrobial medicines use and their knowledge about AMR issue.

5 AIM OF THE STUDY

The aim of the study was to understand the retail pharmacist's perceptions regarding AMR, and their challenges at work focusing on antimicrobial medicine when used for patient's treatment and awareness about AMR among retail pharmacist.

6 METHODOLOGY

6.1 STUDY DESIGN

The qualitative study design was used to explore retail pharmacists' perception and knowledge about AMR from Bangladesh. The retail pharmacist is one of the key members of the healthcare system and a major source of medicine for the resident of the country. Individual in-depth interviews were used, with a topic guide to capturing the pharmacists' views for dispensing antimicrobial medicine to patients. It would not be possible to capture an individual's

consciousness and thoughts of AMR with a quantitative survey, likewise unable to explain challenges with antimicrobial medicine sells faced by the pharmacists.

6.2 STUDY PARTICIPANTS

Personnel who are working in retail pharmacy shops with dispensing medicine and provide treatment advice to the patient were considered eligible to take part in the study. No specific exclusion criteria were set based on the participant's age, gender, work experience, formal training in profession or educational background.

6.3 RECRUITING PARTICIPANTS

All the participants were asked for voluntary involvement in the study. To recruit participants for the study, the snowball technique was applied, with the help of a local supervisor and other pharmacists.

Participants were informed about the interview topic and data protection issue before the interview was conducted. Participants were given the right to terminate their involvement at any time during the interview. Participants were assured that the data will be presented in such a way, it will not be possible to track each individual participant for their contribution to the study. After explaining the data protection issue, the participants signed the informed consent form for the study.

6.4 STUDY PLACE

The study was conducted in the capital city of Dhaka, Bangladesh. Dhaka is economic, political, media and cultural center of Bangladesh, with an estimation of the total population 18 million and to support the growing population, there are various types of retail pharmacy shop around the town. The interview was conducted in various spots of Dhaka city, including slums and major residential areas.

6.5 DATA COLLECTION

To conduct in-depth interviews, a semi-structured question guide was prepared based on the WHO health agendas and other studies performed for AMR mostly conducted in LMIC. The topic covered, in semi-structured question guide, retail pharmacist's motivation to join the profession, challenges faced in their profession, knowledge acquired and utilization for the profession,

understanding antimicrobial resistant, use of antimicrobial medicine for treatment, knowledge about dispensing policy of the country and possible action could reduce AMR.

All the interview was conducted September – October 2018 in a local 'Bengali' language in which all participants feel comfortable and able to express themselves broadest. All interview was recorded with the help of voice recorder software, after getting permission from the participants. For analysis purpose, all audio records were then transcribed into the local language first and then translated into the English language, and three were back translated from English to Bengali to ensure the accuracy. No financial inducements were offered to participants.

6.6 DATA ANALYSIS

For data analysis, content analysis described by Graneheim and Lundman was followed (72, 73). This qualitative analyzing approach was used to understand the apparent meaning of the interview. The analysis was done by the interviewer and the supervisors together. The interviews were read several times to become familiarized with the context and able to identify the inherent value of the interview. Mindjet mind manager software version 2019 from the Corel corporation was used to visualize information with flowcharts and helpful to sort out the meaning units of the interviews (74, 75). The meaning units were condensed and coded according to the inherent meaning. Coded units from the different interviews were collected together and filed into subcategories depending upon the meaning. Later by combining different subcategories, the categories were formed. The categories and subcategories were created by the discussion of the researcher and the supervisors until agreement was reached of the headings.

6.7 ETHICAL CLEARANCE

Ethical clearance was received from the regional committee for medical and health research ethics (REK) in Mid-Norway ref: 2018/998, after receiving this clearance an application was filed to NSD for clearance and receive permission to conduct study ref: 61503/3 /AMS. As the data collection was to be performed in Bangladesh, an ethical clearance application was filled to the local ethical committee of the State University of Bangladesh and received ethical clearance ref no: 2018-09-02/SUB/PHARM/MSN.

7 FINDINGS

A total of 24 different grade retail pharmacists took part in individual interview. There were 5 ‘A’ grade pharmacists, 4 ‘B’ grade pharmacists, 6 ‘C’ grade pharmacists, and 9 were untrained pharmacists. All of them were working in different retail pharmacies. The participants of the study covered a broad variety of retail pharmacist’s backgrounds and education in the community. The ages of the participants varied from 18 to 45 years old. A wide range of educational background of the participants ranged from 10 to 18 years of study. The participants working experience ranged from 1 to 29 years in the profession as a retail pharmacist. The analysis gave nine subcategories, which were merged into three categories. The source of the illustrating quotes has been coded based on the pharmacist’s grade, respondent’s number during the interview and working experiences A_2 - 2 years’ experience (respondent two with an ‘A’ grade diploma and 2 years’ working experiences), C_3 - 10 years’ experience (respondent three with a ‘C’ grade certificate and 10 years’ experience) or similar codes for respondents with ‘B’ grade certificates and untrained pharmacists.

Table 1. Participants’ perceptions divided into categories and subcategories

Categories	Sub-categories
Being a pharmacist	Motivation to join the profession Challenges faced Sources of professional knowledge
Awareness of AMR and treatment with antimicrobial medicine	Understanding AMR situation Common antimicrobial medicine Treatment managed by a pharmacist Antimicrobial medicine misuse
Control and monitor AMR situation	Increase awareness Model pharmacy concept

7.1 BEING A PHARMACIST

7.1.1 Motivation to join the profession

The participants showed a variety of motivations to become a retail pharmacist. This was based on their knowledge, the need of society for medical care, a wish to work in a pharmaceutical profession despite different backgrounds, continue the family tradition to work as a retail pharmacist, or become part in a respectable business and to help underprivileged people.

"*I understand that if we are able to prepare good quality medicine that is not enough, we need also good quality retail pharmacist so that we can hand over quality full medicine in hand of the general people. In our country doctors prescribe medicine and patients take it. But in-between these two of the group, there were no qualified people available in our country. For this reason, my interest grows in this field*." -A_5 - 2 years' experience

Others expressed their interest in the profession, due to their family and friends influence.

"*I developed an interest in this profession after my father got a stroke, I have to take over our family business…. but I am slowly starting to learn which medicine is working for which kind of situation. Then gradually I started to like this profession."* – C_2 - 5 years' experience

Another motivation to join the retail pharmacy profession by considering, retail pharmacy is a profitable and respectable business. And some tries to help healthcare deprived people with their skills who are unable to receive treatment from a physician.

"I consider, pharmacy shop is a respectful and profitable business. The general public requires medicine every other day." – Untrained$_9$ - 2 years' experience

"I came here because with this business I can help people for medical service and the same time I could earn my living." – C_4 - 10 years of experience

7.1.2 Challenges faced

The participants face various challenges during their work. The pharmacists and the customers may have different views for the medical services and medications. The pharmacists were sometimes seen only as shopkeepers and not a qualified expert. In other cases pharmacists face difficulties with long service hours for patients and sometimes problem with the price issue of the medicine.

"Actually, work is not problematic, but challenging. When I work …. patients consider me as a shopkeeper. Though it is not that much problematic, sometimes it creates awkward situation…." – A_3 - 5 years' experience

While providing treatment or selling medicines to patients, the pharmacists felt sometimes that they were disrespected. When the pharmacists give professional advice to a patient about the medicine or treatment, the patient occasionally took the advice negatively and did not want to receive information from the pharmacist.

"Sometimes patients visit the shop when I tried to give them advice in replay they told me "I have consult my problem with high profile doctor… You probably don't know more than him…." - A_5 - 2 years' experience

However, the pharmacists find the variety of activities in the profession interesting. Some retail pharmacists find the meaning of their profession by providing basic treatment to the patients. In some case they find it interesting to read the physician prescription and interpret them correctly; the clients who do not have enough money to pay for the prescribed medication and the pharmacist provide help in another way.

"It seems that the poor people who don't have enough money… I try to give them treatment." – B_1 - 29 years' experience

7.1.3 Source of professional knowledge

The pharmacists received information concerning medical treatment and medicine from various sources, such as medical representatives of the pharmaceutical companies, from other pharmacists with more experiences or from the internet or through a mobile application.

A meaning among the pharmacists was that the pharmaceutical representatives provide necessary information regarding medicine.

"Who else, going to provide us this information. These people from the company visit us, whenever a new product come into the market, and they provide necessary information…" – C_1 - 10 years' experience

Others relied on colleagues' knowledge who had been in the profession for a long time, and some consider they have learned about medicine and treatment through their experience.

"While you are going to work in this profession for a long time, you will know that automatically." – Untrained$_4$ - 18 years' experience

A view from the pharmacists was that they did not need to visit the intuition after they had completed their studies. They meant, they could find all the necessary information over the internet or in the book. Social website and mobile application are becoming popular for medicine-related information and was considered as a convenient and reliable to receive relevant information.

"For medicine related information, I don't need to contact the university. Currently, most of the information is online based…." – A$_5$ - 2 years' experience

""abc" is like other mobile application. It has almost all the medicine related information..." – Untrained$_3$ 1 years' experience

Retail pharmacists, who had completed their professional training from an institute, they considered the training they received, provided them basic information about medicine and profession.

"They didn't give us a 100% idea about medicine, just basic knowledge about medicine. They also make us familiar, with requirement and responsibility while we are going to work as a retail pharmacist." – C$_2$ - 5 years' experience

7.2 AWARENESS OF AMR AND TREATMENT WITH ANTIMICROBIAL MEDICINE

The interviews revealed a wide variety of knowledge and concerns regarding AMR in Bangladesh among pharmacists. It seemed like pharmacists with higher education, were more knowledgeable but they are less involved with AMR topic in the profession. However, the participants gave also examples of great ignorance, misuse of antimicrobial medicines, poor understanding among retail pharmacists and client's inexperience about AMR.

7.2.1 Understanding AMR situation

There were pharmacists who considered patient's abuse the antimicrobial in the number of ways, like consuming medicines before needed or incomplete the course for their treatment. Pharmacists worried that some microorganisms already have developed resistance against conventional antimicrobial medicines and thus those medicines are not used nowadays. Others consider

physicians are prescribing more effective antimicrobial medicines than before as conventional medicine was not working properly.

"Antimicrobial resistance is when a microorganism develops resistance….Then we need to take various type of antimicrobial agents. If anyone doesn't take a full course…. The remaining microorganism within the body, in order to protect themselves from future antimicrobial agents, they change the lifestyle by bringing structural change. These structural change … is resistance…" – A_1 - 2 years' experience

"[When the] *antibiotic is not working properly, doctors either prescribe higher doses or more powerful antibiotic…."* – $Untrained_9$ - 2 years' experience

One opinion was that persons from rural area are more susceptible to development resistance despite they complete the full course of medication as per physician's indication due to inferior quality medicines are mostly sold in that area.

"Even, people outside Dhaka, who complete the full course of medication will develop resistance, due to low potency of the medication…." – A_2 - 8 years' experience

There were some participants who considered AMR is not a concerned issue for them. They try to follow the physician's prescription when dispensing medicines to the patients.

"It is not my concern. Doctor's chamber is not around this shop, so it is not my concern. I tried to sell antibiotic as per doctors' indication…." – C_1 - 10 years' experience

"Though we like to see the prescription. But if they are able to recall the name of medicine, then we understand that patients might know about that medicine … Besides, it is not our responsibility to stop the sale of the medication. Also, antibiotic is not any poison, which will kill you…." – $Untrained_2$ - 7 years' experience

The pharmacists were less involved with AMR issue in their profession unlike in their studies. They hardly ever discussed with other people or colleague expressing AMR.

"… I was more attached to this topic during my study life, then professional life. In professional life awareness regarding this has not built up that much." – A_3 - 5 years' experience

Pharmacists deliberated, contributing factors for the development of AMR, and they were seen as a lack of awareness, patient's wishes for self-treatment and incomplete medicines which were assigned for patients.

"I think that in here, the main reason for this development is the lack of our awareness. ... even if they know this they do not care about it. Second, many patients want to perform self-treatment without visiting the doctors, and they take antibiotic as they like…." – A_5 - 2 years' experience

A later impact due to AMR incidence expressed by the participants was that the treatment cost will be increase and it will force patients to buy less quantity of medicines than indicated.

"… *most of the people are going to spend a lot of money for the health care service is more important*…" – A_1 - 1 years' experience

7.2.2 Common antimicrobial medicine

Broad-spectrum antibiotics like cephalosporin and macrolides are frequently used and consider common antibiotics by the pharmacists. Patients are using the broad-spectrum antimicrobial medicines for common infections. They do not expect or want the information for the commonly used medicine from health professionals, due to ignorance, or both the patient and the shop keeper do not have time for exchange information.

"Yes, sometimes they come to us looking for medication. Nowadays "Zimax 500" (azithromycin) is a common medicine. Everyone knows about this medicine. So, they don't need our help or doctor help when they're going to take this one…." – C_4 - 10 years' experience

The participants did have hesitation to provide multiple antimicrobial medications, regardless of the patient's condition and they understand this will create financial burden as well as patients will incomplete the medication course. Sometimes patients do not like to take multiple antimicrobial medicines even prescribed by the physician. Patients express, by taking multiple antimicrobial medications make them physically weak.

"I never provide multiple antibiotic to patients, if a single antibiotic is not working then we moved to powerful antibiotic…. But never these two antibiotics at the same time." – B_2 - 29 years' experience

"I think that this kind of situation is comparably low … they took mostly single antibiotic at a time. I think that they have a sense, that taking an antibiotic will make your body much weaker." – A_2 - 8 years' experience

7.2.3 Treatment management by a pharmacist

Pharmacists tries to recreate the physician's prescription pattern when they recommend medicine to the patients' health problems. Some participants had a good relationship with physicians outside the profession and thus they contacted with them in case of a complicated situation of the patients. Others meant that they provide treatment to patients who are unable to get in touch with the physician for their health problems. The patients wish for self-treatment, some case looks for advice from the experienced retail pharmacists.

"Most of the time, I call one of my known doctor "abc", who is really helpful to me. He works over a hospital…. I don't provide any treatment which I don't understand. When I face complications I contact him." – C_5 - 15 years' experience

"*Some time they equate medication with their doctor's prescription… They notice medication I provide them, the same type of medication also provides them by the doctors. They develop trust for the medication…, so they don't want to waste money over doctor's check-up."*– $Untrained_5$ - 4 years' experience

Though pharmacists provide various medical services to their patients some understand by the profession they are not allowed to provide treatment to the patients.

"Actually, we pharmacist do not have authority to provide treatment. But sometimes do that, due to business purpose…." – C_4 - 10 years' experience

Some pharmacists meant that physicians are commonly prescribing antimicrobial medicines to the patients' condition based on their previous experience, without waiting for the diagnostic tests.

"Doctors have a logic that, patients don't want to wait for the cultural test result, or patient's situation might become worse if they wait for the result. For this, doctors tend to prescribe an antibiotic based on the empirical situation." – A_4 - 20 years' experience

7.2.4 Antimicrobial medicine misuse

Self-treatment is common and popular among patients for different reasons. Patients think they recognize their infectious problems and want to use the same kind of medication as used before. They do not want to go to physicians for a health checkup, as it may be costly and time-consuming. Another problem is that they decide themselves on how long they will continue medicines and they usually stop taking medicines after the symptoms may have disappeared, regardless of advice to fulfill a course of medicines. Living with poverty, may make them avoid from buying a full course to start with, and they prefer to wait to see the effect of the first day's treatment otherwise they try to negotiate with the prize. Participants also meant that patients often believe that antimicrobial medicines are suitable for the various infectious problems and help them to recover faster from a health problem. And even in some situation the patients come with an old prescription of theirs or prescription from another person and want to repeat that medication.

"Many people have a concept that, for any kind of disease related problem, an antibiotic is the best treatment. If they took antibiotic they will recover faster." – A_4 - 20 years' experience

"Over here, patients use antibiotic frequently. It is because people want to become well faster from their infection problem." – $Untrained_8$ - 2 years' experience

"Majority people took antibiotic for their common problem. They have memorized which medication they need for their problem…" – C_5 - 15 years' experience

Overall when the patient's condition is not complicated, they are more likely to skip the full course of medicine and they want to stop taking medicines as soon as they feel well.

"It depends on the patient situation… If the patient's condition is really critical, in that case, they will purchase full course of that medication…. but they have a tendency of taking parts of the antibiotic course instead of taking full course at a time." – C_2 - 5 years' experience

The pharmacists meant that literate people are showing health consciousness and tried to buy full courses of medicines. Also, patients buy the full course of medicine when the medicines is prescribed for a short medication courses and in case of longer medication courses they are unlikely to buy full dose at a moment, and when patients spend time and money for physician consultation they are more like to complete the courses.

"For 3 days course they buy a full course, but for 7 days treatment, they usually take few antibiotics for the first time. Later they come if their problem sustains." – C_4 - 10 years' experience

"When patients visit the doctors with 1000 taka [13 USD] consultation fees. That time they consider that they have invested money, so they need to complete the medicine course." – C_5 - 15 years' experience

Some participants admitted that they sometimes share newly available medicines in the market with patients and try to influence them to buy new medicines instead of prescribed medicines.

"Sometimes, when company representative visits us… They told us that, they have launched a new antibiotic, which is more effective than conventional…. When patients visit us with their prescription… we also told them there are new antibiotics in the market which might work better." – $Untrained_9$ - 2 years' experience

Another suspicion was that the pharmaceutical companies are more involved and try to influence the healthcare sector.

"We are becoming more commercial, the doctors do not follow the patient. They follow the company, which provides them with a financial incentive. They write the medication from that company" – $Untrained_5$ - 3 years' experience

7.3 CONTROL AND MONITORING OF AMR SITUATION

As AMR is a problematic issue in Bangladesh some pharmacists have tried to raise awareness among patients during the consultation with them. They agreed that without awareness, the AMR issue cannot be averted. The participants had a number of suggestions, which could build up awareness, among the patients at different levels, an important role will be played by the educational system and society.

7.3.1 Increase awareness

There is no alternative to increased public awareness. If we can spread the awareness over the radio or TV… If we can run the program in different community or society about this, we can develop the awareness." – A_3 - 5 years' experience

Some participants had concerns towards the training of the pharmacy certification program for the retail pharmacy profession and suggest improving training and education. The professional training needs to be the longer duration and at the same time, the education background of the trainee, who enrolled in such a program need to be checked before enrolled.

"In the case, I will definitely change the pharmacy training program. Now training last for 3 months but it is not sufficient enough to learn a different aspect of medication." – C_2 - 5 years' experience

Regarding consultation with patients about medicine or health problem, graduate pharmacists tried to share extra information with patients, besides the information provided on the prescription, and others did not want to make worry their clients. The pharmacists seldom or never received any feedback from the patients about their health condition or medicines used during treatment and made them demotivated from healthcare counseling.

"In that case, we told them about before a meal or after a meal. Sometimes we talked about a possible interaction. …" – A_3 - 5 years' experience

However, others did not want to provide medicines related information to the patients for various factors seemingly because of ignorance of patients and lack of knowledge of pharmacists.

"This kind of advice we don't give them. Because in our country there are lots of self-made doctors. They try to give a different kind of suggestion…We try to avoid this kind of situation….." – C_6 - 24 years' experience

"… I don't give them too much information because if they hear more information, they might become a scare or confused about their situation…." – Untrained$_5$ - 4 years' experience

7.3.2 Model pharmacy concept

The government was previously unable to monitor retail pharmacy practice adequately, but the government tries to improve the situation gradually, by introducing standard practice of the pharmaceutical services, to improve the public healthcare. The new concept of introducing a 'Model pharmacy' is anticipated. An expectation is that the doctors might not write the pharmaceutical company's brand name in the future, but prescribe with the generic name of the

medication. A properly implemented regulation to control the sale of antimicrobial medicines over the counter, without prescriptions could be beneficial.

"For so long our government has been planning to start idle pharmacy, but due to different problems, the government was not able to start the initiative of the 'Model pharmacy' program on a pilot basis. So, later if it proves to be successful than government plan to improve its program gradually." – A_1 - 1 years' experience

"In our country, you can take almost 80% of all existing medicines without prescription"- B_1 - 9 years' experience

8 DISCUSSION

The present study reveals that AMR is a known and major health problem in Bangladesh, like in other LMICs, but it has received little recognition. International organizations have tried to estimate AMR condition in LMICs, but due to weak surveillance and lack of policies, it is complicated to gather prevalent data (62, 71).

Retail pharmacists are often seen as the gatekeepers of medicines (51). They stand at the interface between physician and patients by providing the quality and appropriate medicine for the patient's needs. However, when they do not perform to the global standards fully, it becomes difficult to improve the healthcare system. International organizations, such as WHO and the International Pharmacy Federation, believe that local pharmacy services of LMIC are an underused resource and if the professionals could contribute effectively and extensively in the public health care, it would help the country to achieve health agendas despite facing a shortage of healthcare personnel (76).

Even after four decades of independence, Bangladesh has given little importance over retail pharmacists as they are considered outside of public healthcare system (61), whereas pharmaceutical services provided by the pharmacists are well established and widely available in high-income countries like the United States, United Kingdom, Canada, Australia, and New Zealand and they have produced remarkably positive health outcomes within these countries (61, 65).

Absence of national surveillance programs for AMR within the country policy and health system make it hard to estimate the antimicrobial resistance situation (10).

8.1 KNOWLEDGE GAP

Pharmacists in Bangladesh stated that they do not receive any formal or sufficient training before joining the profession, which is also found in other studies from the country (38, 54). According to the country's policy, there is no compulsory minimum educational requirement of the pharmacists for working in retail pharmacies (38, 61), while in India in order to work in retail pharmacy, a pharmacist needs an education equivalent to 2 years diploma and 3 months of training either from a hospital or a community pharmacy (77, 78). A perception among the participants in

this study was that the professional training is not enough for them and they are unable to enroll into other advanced trainings to enrich their knowledge, whereas in India qualified personal receive additional training to remain knowledgeable about their profession (77). The pharmacists in our study relied on information mostly from the pharmaceutical companies or from other senior pharmacists for their profession, just like another study from Bangladesh found (79). The grade pharmacists in our study received their knowledge of AMR during their education, but after that they did not discuss it with other colleagues. The pharmacy curricula in Malaysian universities covers characteristics of AMR extensively and they share and enhance AMR knowledge within the profession to improve the health outcome, even though Malaysia is considered as a middle-income country (80-82). This shows the need to improve the pharmacy education and overall training also in Bangladesh in a similar way.

Broadcasting information about medicine in mass media is strictly prohibited in Bangladesh and the pharmacists learn about new medicines from the pharmaceutical companies (43, 83). This was seen in our study, that companies often shared commercialized information regarding medicine and tried to influence pharmacists to provide certain medicines to the patients wherein high-income countries pharmaceutical companies emphasize on the social responsibility to reduce drug-related disease burden (43).

Pharmacists are the first-hand contact with the patients after they receive treatment and prescriptions from a physician. The pharmacists share only basic instruction about medicine to their patients, unless the patients specifically ask for it. As the pharmacists have difficulties to obtain adequate information regarding AMR and the patients often do not feel the need to learn about medicine and AMR, that's create a knowledge gap both for pharmacists and patients.

8.2 PRACTICE GAP

Bangladesh has a high OPPs, thus unqualified healthcare service provider and self-treatment may be primary sources to meet the patient's needs. Pharmacists seem to get much of their knowledge from practical experiences and try to recreate the physician's prescription patterns for patient's conditions; which may result in improper diagnosis and providing unnecessary medicines to the patients, which can also be seen in other neighboring countries, India, Pakistan (57, 78). In Bangladesh, the physicians prescribe broad-spectrum antimicrobial medicines to cover the

patient's infectious problems, and the pharmacists also provides same type of medication without a prescription. However in India, antimicrobial medicines are mostly used based on type (broad spectrum/ narrow spectrum) of antimicrobial medicine appropriate for the infection of the patient (26). In Europe, the pharmaceutical service has been improved via medication review in collaboration with pharmacists, physicians, and patients (84), while in Bangladesh the participating pharmacists hardly received any responses from patients regarding medication use for their health problem. Neither do they perform any medication review together with the physicians.

Participants agreed that patients consume antimicrobial medicine all around the year, both for minor and major infectious problems, while the European Surveillance of Antimicrobial Consumption Network (ESAC-Net) shows that patients highly consume antimicrobial for the specific seasonal problems rather than for general causes (85, 86).

In some situation, the pharmacist dispenses medication based on the patient's old prescription for their health problems, which may lead to a wrong selection of medicine. This practice is common in other LMIC, including India and Nepal (51, 78). However, in a worst-case scenario, the patients bring someone else's prescription for their medical treatment, and some pharmacists admit dispensing the medication after the patient's request.

Irrational antimicrobial use is common in Bangladesh through prescriptions and self-medication (62). Easy availability of antimicrobial medicines and lack of regulation make it difficult to control self-medication. Further problems arise when physicians are reluctant to follow prescription guidelines, which makes it more difficult to minimize the antimicrobial medicine consumption. Consumption of antimicrobial without a medical prescription is 3% in Sweden which is lowest in the world, whereas in Bangladesh it is 86%, and in other LMIC such as - India and Uganda, it is 66.7% and 75.7% respectively (87, 88).

8.3 LOOKING FORWARD

The high degree of health inequality in Bangladesh demands reorganization and reorientation of the existing healthcare including improving retail pharmaceutical services (55). This should be addressed according to the UN SDG to serve for equality (Goal 5) and to ensure health for all

(Goal 3) (89, 90). Lack of healthcare funding, shortage of physicians, and improper diagnosis are core reasons for the depravation of the required healthcare for a large number of poor underprivileged people. Pharmacists could play a major role to improve the healthcare in Bangladesh like in other LMIC (10, 69). Like in Nepal, Bangladesh has more drug outlets which offer treatment to the patients, unsupervised by the qualified medical personal, than governmental hospitals (10).

The motivations to join the profession differ among pharmacists, but they understand their importance and want to provide high quality pharmaceutical services to the patients. Though many do not have a proper education, in our study they seem eager to learn about new medicines and information. A common view was that if they are properly equipped and had sufficient education and training, they would be able to use their knowledge to improve the healthcare services. A study from Zambia shows that training programs designed for the pharmacists to learn about antimicrobial medication, have significantly reduced the antimicrobial misuse among patients and pharmacists (10, 69).

In high-income nations, medication management training is offered to the retail pharmacist to ensure safe and effective medication therapy for patients (65). In India, they arrange 'pharmacy weeks' with workshops and seminars, aiming for pharmacists to enrich their knowledge and buildup awareness among patients about pharmacist's contribution in the healthcare services (78, 91), such promotion can be used to improve pharmaceutical services among Bangladeshi pharmacist. The new concept 'Model Pharmacy' is an initiated example of this.

Despite the aggressive marketing of pharmaceutical companies, retail pharmacists do not recommend multiple antimicrobial medicines to their patients. In addition, in some cases, pharmacists try to counsel the patients against broad-spectrum medication consumption and try to offer quality medication from their best knowledge, unlike in Pakistan where they do not give any counselling (57).

The government's initiative to standardize pharmacy practice in recent years, is aimed to encourage appropriate use of medication among consumer and to buildup awareness among patients and pharmacists about high-quality pharmaceutical services (92).

8.4 TRUSTWORTHINESS

To ensure *credibility* of the study, the design and methodology of the individual interviews are described. The student frequently visited the data during the analysis process for gaining deep understanding of the material. He discussed with the supervisor's categories and subcategories and bestowed the findings with relevant quotes from the participants. Both international supervisors have vast experiences in conducting studies in LMIC and with experiences of qualitative research methods and the collaboration of a local researcher with knowledge of the study topic and context was important. To achieve *dependability,* the student, who is fluent in the local language and context, conducted all the in-depth interviews for two months. A clear description of the study topic and setting, study participant's inclusion criteria, recruitment, data collection and analysis process has been described to gain *transferability.*

8.5 STRENGTH AND LIMITATIONS

Strength

The main strength of this study is that is the first qualitative study to explore retail pharmacists' perception for AMR and the challenges they faced while managing sells and provide service to the clients. Previous quantitative studies have been carried out to determine the extent of AMR in Bangladesh, but they have never investigated and understood perceptions and knowledge from pharmacists selling antimicrobial treatment and their view on AMR. The first author has conducted all in-depth interviews in the local languages, for which the participants are able to express their thought fluently and efficiently. The interview was conducted with different categories of retail pharmacist with varying education background and experience.

Limitations

Some participants were not able to describe their views of the items discussed in the interviews and topics of the study. This may be due to the inexperience of such an interview or lacking knowledge. Some were frequently interrupted by clients in the shop or had to finish the interview before having discussed all topics. We wanted to do the interviews in a context they felt comfortable in, but it may have been better for the participants to meet in a calmer environment. Another limitation of the study is that only male retail pharmacists were included in the study. The reason for this gender bias is that according to the cultural norm in Bangladesh, women are not

involved in the retail pharmacy profession. More information, of knowledge and practice, could have been understood if the interviews, also covered other healthcare personnel, but due to the study design, the only retail pharmacist was recruited for the study.

9 CONCLUSIONS

AMR is a concern topic worldwide, especially in LMIC due to lack of awareness, knowledge, proper policies and monitoring healthcare systems. This study identifies knowledge and practice gap among the retail pharmacist and their perception about AMR and challenges that retail pharmacist's meet in their profession. The pharmacists seemed to understand the reasons for AMR development, but were often unable to describe the long-term impact of AMR over human health. Though they are interested and motivated in the work, they are sometimes disrespected, seen as just shopkeepers. The patients may bring old prescriptions or argue for self-decided medication. Lack of sufficient education on AMR, contacts from pharmaceutical companies who promote certain medications, and social norm for using antimicrobial medicines for every perceived infection without prior counseling may lead to improper practice. Lack of implicated regulations and easy availability of antimicrobial medicines were reasons for medicine misuse, which proves considerable problems of AMR in the country. Innovative awareness programs including the impact of AMR in the professional training program with emphasize on misuse of antimicrobial medicines consumption, and they were positively anticipating outcomes for the introduced 'Model Pharmacy'.

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11 APPENDIX

11.1 APPENDIX 1: INFORMED CONSENT FOR PARTICIPANTS

Are you interested in taking part in the research project?

"Pharmacists perception of their challenges at work, focusing on antimicrobial resistance; a qualitative study from Bangladesh"

This is an inquiry about participation in a research project where the main purpose is to understand about retail pharmacist point of view regarding AMR situation in their following area of Dhaka, Bangladesh.

Antimicrobial resistance (AMR) has become one of the major public health challenges in most parts of the world, mostly affecting the people from the low and middle-income country.

Bangladesh has a high incidence of infectious diseases, and antimicrobial medication misuse may lead to Antimicrobial Resistance (AMR). Retail pharmacy shops and its pharmacist are the preferred first point of contact for a basic health care services among the people of Bangladesh.

Purpose of the project
To understand about retail pharmacist point of view regarding AMR situation in their following area of Dhaka, Bangladesh.

Interviewee will ask series of question based on research question outline and this will help him to understand antimicrobial resistance (AMR) situation in their locality.

Research questions are based on following outline

- Motivation to become a retail pharmacist?
- Understanding about antimicrobial resistance (AMR).
- Understanding about antimicrobial medicine use for treatment in locality.
- Knowledge about drugs law of Bangladesh.

It is thesis work for master level student, who is a student in global health at the Norwegian University of Science and Technology (NTNU). And his supervisor is Professor of NTNU.

The information will be solo collected for the thesis work not for any personal or for any other institution.

Who is responsible for the research project?
Md. Shah Newaz is a master student in global health at the Norwegian University of Science and Technology (NTNU) and his supervisor is Professor Elisabeth Darj.

NTNU is the institution responsible for the project.

Why are you being asked to participate?
Pharmacist and personal who are responsible for dispensing mediation to general health seeker is considered valid participant as they sell medication towards health seeking personal. Different type antimicrobial medication mostly sold by them beside hospital and clinic.

For these reasons retail pharmacist are most notable personal for the study.

Sample will be selected with snowball technique. Most of the interviewee is unknown to applicant so, his local resource will help him out to arrange interview with retail pharmacist.
Until data get saturation interview will carry on for understanding antimicrobial resistance (AMR)

No personal information will be kept about participants.

What does participation involve for you?
Face to face interview with individual participant will be taken consideration for the study. Only retail pharmacist who are working in different retail pharmacy shop are consider as a valid participant. And percipients, all will be adult by the government law of Bangladesh as they will working in different retail pharmacy shop and selling their medication towards patients.

Participation is voluntary
Participation in the project is voluntary. If you chose to participate, you can withdraw your consent at any time without giving a reason. All information about you will then be made anonymous. There will be no negative consequences for you if you chose not to participate or later decide to withdraw.

Your personal privacy – how we will store and use your personal data
We will only use your personal data for the purpose(s) specified in this information letter. We will process your personal data confidentially and in accordance with data protection legislation (the General Data Protection Regulation and Personal Data Act).

If you chose to participate, the information you give to me will be handled anonymously and not disclosed. No names will be registered, only age, gender and for how long you have been working as a pharmacist. The discussion among us two will be recorded with your permission and the original audio record and transcription will be kept safe. Audio records will be deleted after the transcription and translation to English. The data materials are only accessible to me, the master student, and my supervisor. When the results from the study are presented, it will not be possible to trace anything back to you
No personal information will be published later and after the study time period data will be destroyed, so no one able to trackback the participants.

What will happen to your personal data at the end of the research project?
The project is scheduled to end JUNE 2019, after the study time period data will be destroyed, so no one able to trackback the participants. Beside this Information of anonymity will be given to the respondents, for which no personal information about respondent will be taken during the study period.

Your rights
So long as you can be identified in the collected data, you have the right to:
- access the personal data that is being processed about you
- request that your personal data is deleted
- request that incorrect personal data about you is corrected/rectified
- receive a copy of your personal data (data portability), and

- send a complaint to the Data Protection Officer or The Norwegian Data Protection Authority regarding the processing of your personal data

We will process your personal data based on your consent.

Based on an agreement with NSD – The Norwegian Centre for Research Data AS has assessed that the processing of personal data in this project is in accordance with data protection legislation.

Where can I find out more?

If you have questions about the project, or want to exercise your rights, contact:

- [Insert name of institution responsible for the project] via [insert name of the project leader]. For student projects you must include contact details for the supervisor/the person responsible for the project, not just the student.
- Our Data Protection Officer: [insert name of the data protection officer at the institution responsible for the project]
- NSD – The Norwegian Centre for Research Data AS, by email: (personverntjenester@nsd.no) or by telephone: +47 55 58 21 17.

Yours sincerely,

Project Leader (Researcher/supervisor)

Student (if applicable)

Consent form

Consent can be given in writing (including electronically) or orally. NB! You must be able to document/demonstrate that you have given information and gained consent from project participants i.e. from the people whose personal data you will be processing (data subjects). As a rule, we recommend written information and written consent.

- For written consent on paper you can use this template
- For written consent which is collected electronically, you must chose a procedure that will allow you to demonstrate that you have gained explicit consent (read more on our website)
- If the context dictates that you should give oral information and gain oral consent (e.g. for research in oral cultures or with people who are illiterate) we recommend that you make a sound recording of the information and consent.

If a parent/guardian will give consent on behalf of their child or someone without the capacity to consent, you must adjust this information accordingly. Remember that the name of the participant must be included.

Adjust the checkboxes in accordance with participation in your project. It is possible to use bullet points instead of checkboxes. However, if you intend to process special categories of personal data (sensitive personal data) and/or one of the last four points in the list below is applicable to your project, we recommend that you use checkboxes. This because of the requirement of explicit consent.

I have received and understood information about the project [insert project title] and have been given the opportunity to ask questions. I give consent:

- ☐ to participate in (insert method, e.g. an interview)
- ☐ to participate in (insert other methods, e.g. an online survey) – if applicable

- for my/my child's teacher to give information about me/my child to this project (include the type of information)– if applicable
- for my personal data to be processed outside the EU – if applicable
- for information about me/myself to be published in a way that I can be recognized (describe in more detail)– if applicable
- for my personal data to be stored after the end of the project for (insert purpose of storage e.g. follow-up studies) – if applicable

I give consent for my personal data to be processed until the end date of the project, approx.

- (Signed by participant, date)

11.2 APPENDIX 2: INTERVIEW GUIDE – ENGLISH VERSION

Topic guide for individual interviews

I will introduce myself (my name, where I am from, what is my study type, what is my motive to learn from this study, and they are consent about study)

Let us start, please tell me a little about your work position, education level, length of work experience, ownership/employee of the establishment, age

What is your motivation to become a pharmacist?

Probe for:

What motivated you to become the retail pharmacist?

And what influences you when you are selling medications toward patients?

Which part of your work do you find it interesting?

From where you receive medical related information? From Literature, Other pharmacists, Own education, Newspaper, Medical representative from pharmaceutical company.

In your day to day activity what kind of problem you face?

Have you heard much about worries of antimicrobial resistance?

Probe for:

What do you know about Antimicrobial resistance?

After your education or retail pharmacist training, do you still go to courses and if so, do they discuss antimicrobial resistance there?

Does other fellow or mentor pharmacist or other retail pharmacy college discuss about antimicrobial resistance issue?

Do you have any idea about the Antimicrobial resistance (AMR) situation in your work place or in Dhaka city?

Which long term impact of antimicrobial resistance (AMR) does worry you most?

Now can you tell me some about patients asking for antibiotic treatment?

Probe for:

Do patients often ask for antibiotic treatment? Do they ask for your advice for medication? Do they prefer self-medication? How often they look for your advice?

Do they prefer to buy antibiotics with or without the prescription for their situation? What kind of behavior do they have when they come to buy antibiotic?

When patients look for medical advice regarding buying antimicrobial medicine, about their infection situation, what kind of advice do you provide to them?

Do you give them any special information / warning regarding antimicrobial medication before they take for their treatment? Or about antimicrobial resistance? Do patients ever bring up the question concerns about antimicrobial drugs?

Do the patients ever give you any feedback regarding antimicrobial medication or about their health condition?

Do patients strictly follow prescription in terms of buying antimicrobial medication or want to buy partial / full course medication dose according to prescription?

Antimicrobial medication pattern

Probe for.

What kind of antimicrobial medication, do patients usually buy within your service area?

What in your opinion on what kind of symptoms or illness patients buy antimicrobial medication commonly?

What quality or price medication people prefer to buy?

My last topics are about drugs law of Bangladesh?

Probe for.

Do you have any specific opinion on the existing medicine laws of the country?

In your opinion, do law need to be revised, or it is fine as it is now to handle AMR situation within the country? What kind of change it need to improve the situation?

In your opinion what do you want to include in pharmacy training or in the country health policy in order to control AMR?

Thank you so much for participating in this study. Do you have anything more you would like to add or inform me about?

Stop recording

11.3 APPENDIX 3: INTERVIEW GUIDE – BENGALI VERSION

সাক্ষাতকারের জন্য বিষয় গাইড

আমি নিজেকে পরিচয় করিয়ে দেব (আমার নাম, আমি কোথা থেকে এসেছি, আমার পড়াশোনার ধরন, আমার এই গবেষণায় থেকে কী শিখবো, এবং তাদের অধ্যয়ন সম্মতি)

আপনার সম্পর্কে বলুন দয়া করে, আপনার কাজের অবস্থান ও ধরন, শিক্ষার স্তর. বয়স, কাজের অভিজ্ঞতা, মালিক / কর্মচারী

আপনার ফার্মাসিস্ট হওয়ার প্রেরণা কি?

আপনি ফার্মাসিস্ট হওয়ার পিছনে অনুপ্রাণিত কেন?

আপনার কাজের কোন অংশটি আপনি এটি আকর্ষণীয় মনে করেন?

আপনার কাজের শিক্ষার তথ্য কোথা থেকে পান?

আপনার কাজে কি ধরনের আপনি সমস্যা সম্মুখীন হন?

আপনি কি আমাকে বলতে পারে আপনি কি অ্যান্টিমাইক্রোবিয়াল প্রতিরোধের সম্পর্কে শুনেছেন?

আপনি অ্যান্টিমাইক্রোবিয়াল প্রতিরোধের সম্পর্কে কি জানেন?

আপনার শিক্ষা বা প্রশিক্ষণে, আপনি কি এখনও কোর্সে যান এবং যদি তাই হয়, তারা কি সেখানে অ্যান্টিমাইক্রোবিয়াল প্রতিরোধের কথা বলে?

অন্যান্য সহকর্মী বা পরামর্শদাতা ফার্মাসিস্ট বা অন্যান্য খুচরো ফার্মেসী সাথে অ্যান্টিমাইক্রোবিয়াল প্রতিরোধের বিষয়ে আলোচনা করেন? এই বিষয়ে কোন ভাবে আপনাকে চিন্তিত করে?

আপনি এলাকায় এন্টিাইক্রোবিয়াল প্রতিরোধের পরিস্থিতি সম্পর্কে কোন ধারণা আছে?

অ্যান্টিমাইক্রোবিয়াল প্রতিরোধের কোন ক্ষতিকারক অংশের প্রভাব আপনি সবচেয়ে চিন্তা করেন?

এন্টিবায়োটিক চিকিৎসার জন্য রোগীদের সম্পর্কে এখন আপনি আমাকে কিছু বলতে পারেন?

তারা কি ধরনের ঔষধ পছন্দ করেন? তারা কি আপনার কাছে ঔষধ জন্য পরামর্শ সন্ধান করে?

তারা প্রেসক্রিপশন সঙ্গে বা ছাড়া অ্যান্টিবায়োটিক কিনতে কি পছন্দ করেন?

তারা এন্টিবায়োটিক কিনতে আসে যখন তারা কি ধরনের আচরণ আছে? ক্রয় করে সম্পূর্ণ / আংশিক কোর্স, না কি খুজে বিশেষ মানের ঔষধ ?

রোগীদের চিকিৎসা পরামর্শ সন্ধান করার জন্য আপনি সেবা সন্ধানকারীকে কোন ধরনের পরামর্শ দিচ্ছেন?

আপনি কি তাদের কোন বিশেষ তথ্য / অ্যান্টিমাইকোবায়াল ঔষধ সম্পর্কিত সতর্কবাণী দেন? অথবা অ্যান্টিমাইকোবায়াল প্রতিরোধের সম্পর্কে?

তারা কি কখনও ঔষধ সংক্রান্ত কোন মতামত দেয়?

রোগীরা কঠোরভাবে অ্যান্টিমাইকোবায়াল ঔষধ কেনার ক্ষেত্রে প্রেসক্রিপশন অনুসরণ করে?

আপনি কি অ্যান্টিবায়োটিক গ্রহণকারীকে সনাক্ত করতে পারবেন?

অ্যান্টিমাইকোবায়াল ঔষধ প্যাটার্ন সম্পর্কে

অ্যান্টিমাইকোবায়াল ঔষধ কি ধরনের রোগীরা সাধারণত আপনার এলাকার মধ্যে কিনে থাকে?

রোগীরা সাধারণত কি ধরনের অসুস্থতার কারনে আপনার অ্যান্টিমাইকোবায়াল ঔষধ কিনে?

কি মানের ঔষধ মানুষ কিনতে পছন্দ করেন?

আমার শেষ বিষয় বাংলাদেশের ঔষধ আইন সম্পর্কে?

বিদ্যমান আইন আপনার কোন নির্দিষ্ট মতামত আছে?

আপনার মতে কি সংশোধন করলে, বাংলাদেশে রোগ প্রতিরোধের পরিস্থিতি উন্নত করা যাবে?

এই গবেষণায় অংশগ্রহণের জন্য আপনাকে অনেক ধন্যবাদ। আপনি কি আরো কিছু যোগ করতে জানাতে চান অ্যান্টিমাইকোবায়াল প্রতিরোধের সম্পর্কে?

রেকর্ডিং বন্ধ

11.4 APPENDIX 4: ETHICAL APPROVAL FROM REC

REK
REGIONALE KOMITEER FOR MEDISINSK OG HELSEFAGLIG FORSKNINGSETIKK

Region:	Saksbehandler:	Telefon:	Vår dato:	Vår referanse:
REK sør-øst	Hege Cathrine Finholt, PhD	22857547	25.06.2018	2018/998 REK sør-øst D
			Deres dato:	Deres referanse:
			07.05.2018	

Vår referanse må oppgis ved alle henvendelser

Elisabeth Darj
Norges teknisk-naturvitenskapelige universitet

2018/998 Apotekeres oppfatning av deres utfordringer på jobben, med fokus på antimikrobiell resistens; en kvalitativ studie fra Bangladesh

Vi viser til søknad om forhåndsgodkjenning av ovennevnte forskningsprosjekt. Søknaden ble behandlet av Regional komité for medisinsk og helsefaglig forskningsetikk (REK sør-øst D) i møtet 13.06.2018. Vurderingen er gjort med hjemmel i helseforskningsloven § 10.

Forskningsansvarlig: Norges teknisk-naturvitenskapelige universitet
Prosjektleder: Elisabeth Darj

Prosjektleders prosjektbeskrivelse
Antimicrobial resistence is a global threat to health. In resource limited settings people are able to buy antibiotic treatment over the counter with or without perscription. This qualitative study with individual interviews will shed lights on how pharamacists in Bangladesh are perceiving the matter of antimicribial resistence.

Vurdering
Pursuant to section 4 of the HRA, the following definition applies for medical and health research: Activity conducted using scientific methods to generate new knowledge about health and disease.

The aim of the project is to assess the ways in which pharmacists in Bangladesh perceive the matter of antimicrobial resistence.

The Regional Committee considers that the project will lead to new knowledge about the pharmacists treatment of antimicrobial resistence and the use of antibiotic treatment in Bangladesh, rather than new knowledge about health and disease. Hence, the above mentioned study falls outside of the scope of the HRA, and the project is exempt from review in Norway, cf. §§ 2 and 4 HRA. Even though the project can be implemented without the approval from the Regional Committee for Medical Research Ethics, it may be subject to local legal requirements (i.e. any necessary permits must be collected from the authorities in the participating countries). Given that some of the analyses will be done in Norway, the Personal Data Act will apply if identifiable personal data will be obtained.

Please do not hesitate to contact the Regional Committee for Medical and Health Research Ethics, section South-East D (REK Sør-Øst D) if further information is needed.

Vedtak
The study is exempt from review, cf. §§ 2 and 4 HRA.

The Committee's decision was unanimous.

Besøksadresse: Gullhaugveien 1-3, 0484 Oslo
Telefon: 22845511
E-post: post@helseforskning.etikkom.no
Web: http://helseforskning.etikkom.no/

The decision of the Committee may be appealed to the National Committee for Research Ethics in Norway. The appeal will need to be sent to the Regional Committee for Research Ethics in Norway, South-East D. The deadline for appeals is three weeks from the date on which you receive this letter.

Med vennlig hilsen

Finn Wisløff
Professor em. dr. med.
Leder

Hege Cathrine Finholt, PhD
Rådgiver

Kopi til:elisabeth.darj@ntnu.no
Norges teknisk-naturvitenskapelige universitet ved øverste administrative ledelse:
postmottak@adm.ntnu.no

11.5 APPENDIX 5: ETHICAL APPROVAL FROM NSD

Elisabeth Darj
Postbok 8905
7491 TRONDHEIM

Vår dato: 19.07.2018 Vår ref: 61503 / 3 / AMS Deres dato: Deres ref:

Vurdering fra NSD Personvernombudet for forskning § 31

Personvernombudet for forskning viser til meldeskjema mottatt 10.07.2018 for prosjektet:

61503	*Pharmacists perception of their challenges at work, focusing on antimicrobial resistance; a qualitative study from Bangladesh*
Behandlingsansvarlig	*NTNU, ved institusjonens øverste leder*
Daglig ansvarlig	*Elisabeth Darj*
Student	*Md Shah Newaz*

Vurdering

Etter gjennomgang av opplysningene i meldeskjemaet og øvrig dokumentasjon finner vi at prosjektet er meldepliktig og at personopplysningene som blir samlet inn i dette prosjektet er regulert av personopplysningsloven § 31. På den neste siden er vår vurdering av prosjektopplegget slik det er meldt til oss. Du kan nå gå i gang med å behandle personopplysninger.

Vilkår for vår anbefaling

Vår anbefaling forutsetter at du gjennomfører prosjektet i tråd med:

- opplysningene gitt i meldeskjemaet og øvrig dokumentasjon
- vår prosjektvurdering, se side 2
- eventuell korrespondanse med oss

Vi forutsetter at du ikke innhenter sensitive personopplysninger.

Meld fra hvis du gjør vesentlige endringer i prosjektet

Dersom prosjektet endrer seg, kan det være nødvendig å sende inn endringsmelding. På våre nettsider finner du svar på hvilke endringer du må melde, samt endringsskjema.

Opplysninger om prosjektet blir lagt ut på våre nettsider og i Meldingsarkivet

Vi har lagt ut opplysninger om prosjektet på nettsidene våre. Alle våre institusjoner har også tilgang til egne prosjekter i Meldingsarkivet.

Vi tar kontakt om status for behandling av personopplysninger ved prosjektslutt

Dokumentet er elektronisk produsert og godkjent ved NSDs rutiner for elektronisk godkjenning.

Ved prosjektslutt 30.06.2019 vil vi ta kontakt for å avklare status for behandlingen av personopplysninger.

Se våre nettsider eller ta kontakt dersom du har spørsmål. Vi ønsker lykke til med prosjektet!

Katrine Utaaker Segadal

Anne-Mette Somby

Kontaktperson: Anne-Mette Somby tlf: 55 58 24 10 / anne-mette.somby@nsd.no

Vedlegg: Prosjektvurdering
Kopi: Md Shah Newaz, mdsn@stud.ntnu.no

Personvernombudet for forskning

Prosjektvurdering - Kommentar

Prosjektnr: 61503

ASSESSMENT ACCORDING TO NEW LEGISLATION

On 20th July 2018 the EU's General Data Protection Regulation (GDPR) and the new Personal Data Act will come into force. Since your project was notified to the Data Protection Official for Research before this date, your project has been assessed according to current legislation. The legal basis for processing personal data in this project is consent, cf. the Data Protection Act § 8, paragraph 1, and the project has been assessed by the Data Protection Official for Research pursuant to the Personal Data Act § 31. In addition, we have assessed that if the required changes are made to the information letter and consent form (see below), they will meet the requirements of informed consent according to the GDPR. It is therefore our understanding that the consent given by data subjects will act as a valid legal basis for processing personal data pursuant to the GDPR Article 6, para. 1, letter a).

The information letter must also include the following:

- The end date of the project (30.06.19) and that the collected data will be made anonymous by this date.

The Data Protection Official presupposes that the researcher follows internal routines of NTNU regarding data security.

Estimated end date of the project is 30.06.2019. According to the notification form all collected data will be made anonymous by this date.

Making the data anonymous entails processing it in such a way that no individuals can be recognised. This is done by:

- deleting all direct personal data (such as names/lists of reference numbers)
- deleting/rewriting indirectly identifiable data (i.e. an identifying combination of background variables, such as residence/work place, age and gender)
- deleting digital audio and video files

11.6 APPENDIX 6: ETHICAL APPROVAL FROM BANGLADESH

STATE UNIVERSITY
OF BANGLADESH

03 September 2018

Mr. Md. Shah Newaz
Department of Pharmacy
State University of Bangladesh (SUB)

This is to inform you that the Human Ethics Committee of State University of Bangladesh has approved your Study Project Protocol for a period of three (3) years with the following title:
Pharmacists' perception of their challenges at work, focusing on antimicrobial resistance; a qualitative study from Bangladesh.

Your Approved Human Ethics Number: **2018-09-02/SUB/PHARM/MSN**
Validity period: **3 Years (September 2018 to August 2021)**

Please be advised that in case if you require any changes to be made to the approved protocol, you have to submit an application for amendment. If you fail to do so, the Human Ethics Committee of SUB may withdraw the approved protocol.

Wish you the best of luck for the study.

Thank you.

Nawzia Yasmin 03-09-18.

Prof. Dr. Nawzia Yasmin
Chairman, Human Ethics Committee, SUB
&
Dean, Faculty of Pharmacy and Health Science
State University of Bangladesh

Prof. Dr. Nawzia Yasmin
MBBS (DMC), MPH (Sydney Uni-Australia)
Professor & Head
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