

Supplementary File 1

Participant Information Pack

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A. PARTICIPANT INFORMATION SHEET

What drives inappropriate antibiotic use? A mix methodology study in Bahawalpur Pakistan

This information sheet has been designed to give you information about this study. If you have any further queries, please feel free to contact to.....

Purpose of study

You are invited to participate in a research study designed to determine the “What drives inappropriate antibiotic use? A mix methodology study in Bahawalpur, Pakistan”. By this study, we would like to draw the attention of members of society, government and non-governmental organizations, media, and other people working on grass root level towards the importance of rational use of antibiotics.

Your Participation

If you want to participate in the study, you will be interviewed by the data collector. All information collected from your participation will be confidential and it will be used only for the research purpose. This information will be destroyed at the end of the study. Your name will be kept confidential and will not be mentioned in any report or publication. Remember, this is not a test and there are no right or wrong answers.

B. INFORMED CONSENT

You will be asked to sign an informed consent stating that you understand the nature of the study and what is required from you in the study.

Participation in this study is voluntarily and will not affect your privacy. You are free at any time to change your mind and withdraw from the study without needing to justify your decision.

C. INFORMED CONSENT DECLARATION

What drives inappropriate antibiotic use? A mix methodology study in Bahawalpur, Pakistan

1. I undersigned voluntarily, agree to take part in this study which I understand has been approved by responsible authorities at the Islamia University of Bahawalpur.
2. I confirm that a full explanation of the purpose and nature of the study has been explained to me.
3. I have been given the opportunity to ask questions on all aspects of the study and have understood the advice and information given as a result.
4. I agree to co-operate faithfully with the studying investigators with regard to my eligibility to participate in the study.
5. I also understand that failure to take part will no way prejudice my privacy.
6. I consent to the investigators having access to the information in my records, with the understanding that any publication shall not reveal my name or any other personal identifiers.

Signature: _____ **Date:** _____
(Volunteer)

I confirm that I have explained the nature and purpose of the study to this volunteer. If, at any time during the course of this study, new information develops that may affect the volunteer's willingness to continue participation, a statement of this information will be provided to her.

Signature: _____ **Date:** _____
(Researcher)

Witness: _____ **Date:** _____

Part 1: Demographics

1. Respondent ID _____
2. Age (years) _____
3. Gender a. Male b. Female
4. Education level a. Illiterate b. Primary c. Secondary d. University
5. Monthly family Income _____
6. Place of residency a. Rural b. Urban
7. Do you work in health sector? a. Yes b. No
8. Antibiotics purchase a. With prescription b. Without prescription
9. Average antibiotic consumption per year? a. Don't use b. 1-3 c. 4-6 d. >6 e. Don't know

Part 2: Knowledge

Sr. No.	Item	Strongly agree	Agree	Uncertain	Disagree	Strongly disagree
1.	Antibiotics kill bacteria					
2.	Antibiotics treat viral infections					
3.	Antibiotics cure all types of infections					
4.	Antibiotics reduce fever, pain and inflammation					
5.	Antibiotics speed up the recovery from most coughs and colds					
6.	Which of them are antibiotics? a. Penicillin b. Aspirin c. Panadol d. Ibuprofen					
7.	Antibiotic overuse leads to antibiotic resistance					
8.	Antibiotic can induce allergic reactions					
9.	Antibiotics can cause side effects					
10.	You can stop taking the full course of antibiotics if your symptoms improve					
11.	Antibiotic effectiveness is reduced if a full course of antibiotics is not completed					
12.	Are you aware of dangers of Antibiotics overuse?					

Part 3: Attitude

Sr. No.	Item	Strongly Agree	Agree	Uncertain	Disagree	Strongly disagree
1.	When I get cold, I felt antibiotics help me get better more quickly.					
2.	I expect my doctor to prescribe antibiotics if I suffer from common cold symptoms.					
3.	It bothers me when doctor prescribes me antibiotics but does not explain why?					
4.	I prefer to keep antibiotics at home in case there may be a need for them later.					
5.	It is good to be able to get antibiotics from relatives or friends without having to see a medical doctor.					
6.	I prefer to be able to buy antibiotics from the pharmacy without a prescription.					
7.	I like to take antibiotics according to the instructions					
8.	I prefer to check expiry date of antibiotic before taking it					

Checklist for practice:

Sr. No.	Item	Yes	No
1.	Appropriateness of anti-infective agent?	<input type="checkbox"/>	<input type="checkbox"/>
3.	Proper dosage regimen of antibiotics?	<input type="checkbox"/>	<input type="checkbox"/>
4.	Proper dosage form and route of administration?	<input type="checkbox"/>	<input type="checkbox"/>
5.	Ask about side effects from pharmacist at pharmacy?	<input type="checkbox"/>	<input type="checkbox"/>
6.	After taking 2-3 doses you start feeling better.		
	a) Do you stop taking the antibiotics?	<input type="checkbox"/>	<input type="checkbox"/>
	b) Do you save the remaining antibiotics for the next time you get sick?	<input type="checkbox"/>	<input type="checkbox"/>
	c) Do you discard the remaining antibiotics?	<input type="checkbox"/>	<input type="checkbox"/>
	d) Do you give the leftover antibiotics to someone else who is sick?	<input type="checkbox"/>	<input type="checkbox"/>
7.	Do you take antibiotics with		
	a) Water	<input type="checkbox"/>	<input type="checkbox"/>
	b) Juice	<input type="checkbox"/>	<input type="checkbox"/>
	c) Milk?	<input type="checkbox"/>	<input type="checkbox"/>
8.	Do you take antibiotics		
	a) Before meals	<input type="checkbox"/>	<input type="checkbox"/>
	b) After meals	<input type="checkbox"/>	<input type="checkbox"/>
9.	Check of expiry date?	<input type="checkbox"/>	<input type="checkbox"/>

Supplementary File 2

What drives inappropriate use of antibiotics? A mix methodology study

Interview schema for general population

Discussion topic	Example of probes
1. Have you heard of the term “antibiotics” before?	<ul style="list-style-type: none">✓ If yes, please give your best definition of antibiotics✓ What conditions can be treated with antibiotics<ul style="list-style-type: none">• Diarrhea• Cold n flu• Fever• Malaria• Skin infections• HIV n hepatitis• Body aches• Sore throat• Headache
2. Have you heard of the term “antibiotic resistance” before?	<ul style="list-style-type: none">✓ If yes, please give your best definition of antibiotics resistance✓ Where did you hear the term<ul style="list-style-type: none">• Doctor• Nurse• Pharmacist• Family• Media• Can’t remember

<p>3. In your opinion, why antibiotic resistance occurs?</p>	<ul style="list-style-type: none"> ✓ when your body becomes resistant to antibiotics and they no longer work as well ✓ If bacteria are resistant to antibiotics, it can be very difficult or impossible to treat the infections they cause ✓ Antibiotic resistance is an issue that could affect me or my family ✓ Antibiotic resistance is an issue in other countries but not here ✓ Antibiotic resistance is only a problem for people who take antibiotics regularly ✓ Bacteria which are resistant to antibiotics can be spread from person to person ✓ Antibiotic-resistant infections could make medical procedures like surgery, organ transplants and cancer treatment much more dangerous
<p>4. What was the last type of infection you had?</p>	<ul style="list-style-type: none"> a. Type <ul style="list-style-type: none"> ✓ sore throat ✓ loose motions ✓ fever ✓ others b. How long ago was this infection? c. Did you take an antibiotic medication to treat this infection? d. If yes then which antibiotic? e. With whom advice?

<p>5. How do you get antibiotics?</p>	<ul style="list-style-type: none"> ✓ From physician ✓ From pharmacy a) With or without prescription ✓ Home stock of antibiotics from previous illness
<p>6. What is the reason for using antibiotics?</p>	
<p>7. Do you always consult a doctor when you're sick?</p>	<ul style="list-style-type: none"> ✓ If not, why?
<p>8. Would you ask your doctor to prescribe you antibiotics?</p>	<ul style="list-style-type: none"> ✓ If yes, why?
<p>9. Do you seek advice from pharmacist regarding antibiotics you take?</p>	<ul style="list-style-type: none"> ✓ If yes, what type of advice? ✓ If no, why?
<p>10. In your opinion, what should be the waiting time before starting an antibiotic?</p>	
<p>11. Do you think you should strictly follow the prescription of your doctor?</p>	<ul style="list-style-type: none"> ✓ When you stop taking the antibiotic prescribed by your doctor? ✓ In your opinion is it okay to stop taking an antibiotic earlier than recommended if you feel better?
<p>12. What do you do when you miss a dose of the drug?</p>	
<p>13. If your drug does not work, fail to cure infection, how you interpret the situation?</p>	
<p>14. Have you ever experienced adverse effects from taking antibiotics?</p>	<ul style="list-style-type: none"> ✓ What type of adverse effects? ✓ What you did?
<p>15. If you have any suggestion to minimize the antibiotic resistance?</p>	<ul style="list-style-type: none"> ✓ Physician related ✓ Pharmacist related ✓ General public related

Supplementary File 3

Table S.3: Demographic characteristics of non-responders

Variable	Respondents n (%)
Age	
≤ 30 years	37 (59.6)
≥31 years	25 (40.3)
Education level	
Illiterate	12 (19.3)
Literate	50 (80.6)
Gender	
Male	29 (46.7)
Female	33 (53.2)
Residency	
Rural	37 (59.6)
Urban	25 (40.3)
Purchase of antibiotics	
With prescription	28 (45.1)
Without prescription	34 (54.8)

Supplementary File 4

Table S.4: Percentages and frequencies of different levels of knowledge

Statement	Strongly agree	Agree n (%)	Uncertain n (%)	Disagree n (%)	Strongly disagree n (%)
Antibiotics kill bacteria	75 (18.8)	252 (63)	49 (12.3)	19 (4.8)	5 (1.3)
Antibiotics treat viral infections	51 (12.8)	223 (55.8)	88 (22)	32 (8)	51 (12.8)
Antibiotics cure all types of infections	31 (7.8)	195 (48.8)	81 (20.3)	85 (21.3)	8 (2)
Antibiotics reduce fever, pain and inflammation	39 (9.8)	205 (51.3)	82 (20.5)	66 (16.5)	8 (2)
Antibiotics speed up the recovery from most coughs and colds	36 (9)	194 (48.5)	88 (22)	71 (17.8)	11 (2.8)
Which of them are antibiotics?					
a. Penicillin	180 (45)	51 (12.8)	36 (9)	25 (6.3)	108 (27)
b. Aspirin	56 (14)	42 (10.5)	49 (12.3)	34 (8.5)	219 (54.8)
c. Panadol	58 (14.5)	38 (9.5)	39 (9.8)	43 (10.8)	222 (55.5)
d. Ibuprofen	52 (13)	27 (6.8)	31 (7.8)	54 (13.5)	236 (59)
Antibiotic overuse leads to antibiotic resistance	65 (16.3)	165 (42.3)	120 (30)	44 (11)	6 (1.5)
Antibiotic can induce allergic reactions	60 (15)	189 (47.3)	74 (18.5)	66 (16.5)	11 (2.8)
Antibiotics can cause side effects	57 (14.3)	199 (49.8)	108 (27)	32 (8)	4 (1)
You can stop taking the full course of antibiotics if your symptoms improve	65 (16.3)	191 (47.8)	96 (24)	44 (11)	4 (1)
Antibiotic effectiveness is reduced if a full course of antibiotics is not completed	51 (12.8)	193 (48.3)	88 (22)	54 (13.5)	14 (3.5)
Are you aware of dangers of Antibiotics overuse?	36 (9)	105 (26.3)	132 (33)	108 (27)	19 (4.8)

Supplementary File 5

Table S.5: Predictors of antibiotic knowledge: Simple linear regression analysis

Variables	B	S.E	p-value
Age			
≤ 30 years	0.039	0.018	0.436
Education level			
Illiterate	-0.170	0.026	0.001
Primary	-0.104	0.022	0.038
Secondary	0.065	0.018	0.197
University	0.147	0.020	0.003
Gender			
Male	0.016	0.018	0.757
Female			
Monthly family income (Pakistan Rupees)			
≤ 30,000	-0.075	0.18	0.136
Residency			
Urban	0.133	0.022	0.008
Work in health sector			
Yes	-0.026	0.028	0.607
No			
Purchase of antibiotics without prescription			
Yes	-0.058	0.019	0.244
No			
Average use of antibiotics per year			
1-3 antibiotics per year	0.060	0.021	0.233
4-6 antibiotics per year	-0.056	0.027	0.262
>6 antibiotics per year	0.093	0.037	0.063

Supplementary File 6

Definitions

1. University education

In Pakistan university education is higher education beyond 12 years of schooling including undergraduate and graduate degrees.

(Higher Education in Pakistan - World Bank Group)

2. Urban residency

In Pakistan residency in an area having more than 100,000 inhabitants according to census results is considered as urban residency.

https://en.wikipedia.org/wiki/Urban_area

Supplementary File 7

Table S.7: Percentages and frequencies of different levels of attitude

Statement	Strongly agree n (%)	Agree n (%)	Uncertain n (%)	Disagree n (%)	Strongly disagree n (%)
When I get cold, I felt antibiotics help me get better more quickly.	52 (13)	245 (61.3)	59 (14.8)	42 (10.5)	2 (0.5)
I expect my doctor to prescribe antibiotics if I suffer from common cold symptoms.	59 (14.8)	205 (51.3)	85 (21.3)	45 (11.3)	6 (1.5)
It bothers me when doctor prescribes me antibiotics but does not explain why?	60 (15)	193 (48.3)	72 (18)	68 (17)	7 (1.8)
I prefer to keep antibiotics at home in case there may be a need for them later.	44 (11)	166 (41.5)	60 (15)	111 (27.8)	19 (4.8)
It is good to be able to get antibiotics from relatives or friends without having to see a medical doctor.	23 (5.8)	108 (27)	56 (14)	158 (39.5)	55 (13.8)
I prefer to be able to buy antibiotics from the pharmacy without a prescription.	27 (6.8)	135 (33.8)	45 (11.3)	146 (36.5)	47 (11.8)
I like to take antibiotics according to the instructions	73 (18.3)	226 (56.5)	35 (8.8)	55 (13.8)	11 (2.8)
I prefer to check expiry date of antibiotic before taking it	114 (28.5)	162 (40.5)	51 (12.8)	65 (16.3)	8 (2)

Supplementary File 8

Table S.8: Predictors of attitude regarding antibiotic use: Simple linear regression analysis

Variables	B	S.E	p-value
Age			
≤ 30 years	0.040	0.156	0.421
Education level			
Illiterate	-0.127	0.231	0.011
Primary	-0.027	0.196	0.589
Secondary	-0.023	0.159	0.650
University	0.142	0.170	0.004
Gender			
Male	0.117	0.155	0.019
Female			
Monthly family income (Pak Rupees)			
≤ 30,000	0.021	0.159	0.671
Residency			
Urban	0.035	0.194	0.479
Rural			
Work in health sector			
Yes	0.034	0.244	0.502
No			
Purchase of antibiotics without prescription			
Yes	-0.212	0.166	<0.0005
No			
Average use of antibiotics per year			
1-3 antibiotics per year	-0.003	0.180	0.960
4-6 antibiotics per year	-0.037	0.235	0.458
>6 antibiotics per year	-0.005	0.327	0.920
Continuous score of knowledge	0.246	0.033	<0.0005

* Denotes continuous variable

Supplementary File 9

Table S.9: Participant's characteristics and duration of interviews

Respondent	Gender	Age (years)	Interview duration (minutes)
Respondent A	Male	63	42.34
Respondent B	Male	26	40
Respondent C	Male	43	25.11
Respondent D	Male	22	32.01
Respondent E	Male	24	36
Respondent F	Female	29	40.01
Respondent G	Male	31	29.01
Respondent H	Male	34	35
Respondent I	Female	49	25.07
Respondent J	Male	28	36.01
Respondent K	Male	39	36
Respondent L	Male	66	30.16
Respondent M	Male	59	37
Respondent N	Male	45	42.45
Respondent O	Male	38	35.03
Respondent P	Female	39	36
Mean duration			34.82 minutes

Supplementary File 10

Antimicrobial resistance (AMR) is the ability of a microorganism (like bacteria, viruses, and some parasites) to stop an antimicrobial (such as antibiotics, antivirals and antimalarials) from working against it. As a result, standard treatments become ineffective, infections persist and may spread to others.

(World Health Organization)

Supplementary File 11

Table S.11. Most commonly purchased antibiotics without prescription by the respondents

Ailment	Antibiotics used by the participants
Throat infections	Levofloxacin, Co-amoxiclave, Azithromycin, Erythromycin
Sinusitis	Moxifloxacin, Cefixime, Co-amoxiclave
Fever	Ciprofloxacin, Cefixime, Co-amoxiclave
Wounds	Cephradine, Co-amoxiclave
Tooth infections	Doxycycline, Metronidazole

Supplementary File 12

Box S.12: Role of pharmacist being explained to the patients

Role of community pharmacist

- Provide medicine-related information
- Counsel the patient about medicine use
- Answer the queries of patients related to their medicines
- Assess patient's medication for appropriateness and safety
- Observe the effects of medicines in patients
- Early detection and resolution of adverse drug events in patients
- Design therapeutic regimen tailored to individual patient's particular needs
- Promote adherence to medication