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Antibiotic Resistance

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ANTIBIOTIC RESISTANCE: PUBLIC KNOWLEDGE AND PERCEPTION OF ANTIBIOTIC USE IN RELATION TO SOCIAL DETERMINANTS

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ABSTRACT

Objective: To assess the knowledge and perception of appropriate use of antibiotics, when to discontinue the course once the treatment begins and the conditions/illnesses antibiotics treat in relation to social determinants in residents of Wah.

Study Design: Cross sectional-analytical study.

Place and Duration of Study: One year from January to December 2017 in Wah, Pakistan.

Material and Methods: A two stage cluster random sampling technique was used. A total of 400 participants aged 16 years and older completed the validated questionnaire. Chi-square test of significance was applied to determine the relationship between social variables with dependent variables, p-value<0.05 was taken as significant.

Results: Study results showed 114 (28.5%) respondents had wrong perception that using antibiotics previously given to friends/family is a right thing to do. Buying or asking the doctor the same antibiotics that were previously used to treat similar symptoms was considered to be true by 153 (38.3%) participants. The difference between the responses to discontinuation of antibiotic once the treatment begins with household composition (Chi-square=22.723, p=0.012), level of education (Chi-square=46.352, p<0.001), occupation (Chi-square=25.016, p=0.005) and monthly income (Chi-square=38.714, p<0.001) came out to be statistically significant. Respondents who were more educated showed higher percentage in identifying the condition (cold and flu) not requiring antibiotics as 38 (62.3%) in masters and 71 (56.3%) in bachelors category correctly identified it as false.

Conclusion: The study results indicated that young people and those with a lower level of education and socioeconomic profile lacked the knowledge more than any other group.

Keywords: Antibiotics, Antibiotic resistance, Antibiotic Use, Knowledge.

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INTRODUCTION

Antibiotic resistance is growing at an alarming rate and has become a threat to global, regional and national health security[1]. Antibiotic resistance has the potential to burden families and communities not only in the financial terms such as medical costs, lengthy hospital stays, lost wages but also in grim health effects such as mortality[2,3].

Each year 700,000 deaths are attributable to antibiotic resistance and 480,000 people develop multidrug resistance tuberculosis (TB) around the world. Almost two million people develop antibiotic resistant infections, new resistance mechanisms are making infections harder to treat. These resilient organisms emerge as superbugs that are extremely difficult to treat with existing drugs, one such example is that of *Methicillin-resistant Staphylococcus aureus* (MRSA) that has emerged as a 'superbug'. Situation in Pakistan is no different, ranked in top five countries with the highest number of neonatal deaths attributable to antibiotic resistance. Resistance rates to ciprofloxacin in patients suffering from gonorrhea has been reported to be 86% in Karachi.

Today, loss of effectiveness of many antibiotics as well as the collapsed pipeline in development of new class of antibiotics have become a major public health concern[4]. All antibiotic usage leads to antibiotic resistance but irrational use or overuse of antibiotics is considered one of the

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major contributors to the menace of antibiotic resistance[4-6]. Antibiotic usage vary among countries and self-medication with antibiotics, using leftover antibiotics, obtaining medicines from family or friends and stopping the use inappropriately are considered to be the primary contributors to antibiotic misuse and resistance worldwide. The consumption of non-prescribed antibiotics was reported mainly for treating common cold and flu in many countries and was consistent with the misperception that antibiotics are helpful for viral infections in general population[7,8].

The issue of antibiotic resistance is worse in Low and Middle-Income Countries (LMICs) where antibiotics are often over prescribed without standard treatment guidelines by the healthcare community and over-used by general public[9]. In developing countries, drugs are dispensed liberally without responsibility, just to be "on the safe side," sometimes in response to patients' demand, and also for doctors and pharmacists to make more money[10,11]. Pakistan is vulnerable to the emergence and spread of resistant bacteria due to its large, densely packed populations; inadequate water, sanitation and hygiene[10-12]. In Pakistan over the counter availability with sub-optimal antibiotic regulation and stewardship across medical sectors have led to unregulated use of antibiotics[10,13,14]. General practitioners in Pakistan prescribe successive courses of antibiotics until an effective treatment is found. The inappropriate behavior of antibiotic use among the general population, particularly self-medication and the concept of antibiotics seen as a quick fix solution to all illnesses needs to be changed and managed accordingly[15].

Education about the rationalization of antibiotic use is of vital importance as knowledge can help bring positive change in behavior about antibiotic usage and eventually in controlling antibiotic resistance[5,16]. Assessment of knowledge gaps in antibiotic usage and resistance in general public and patients' is imperative in countries where antibiotics are easily available and overused by the general public[17,18]. Moreover better knowledge of antibiotic use among general public makes clinicians more responsible and cautious in their prescribing practices. The study was carried out to assess the public knowledge of antibiotic usage in relation to social determinants. Information captured from this study will help future educational campaigns tackle antibiotic resistance by addressing knowledge and potential gaps of unnecessary use of antibiotics from social aspects at general population level making them more committed to personal actions.

MATERIAL AND METHODS

An analytical cross-sectional study was conducted from January to December 2017 using two stage cluster random sampling technique in the four sectors (randomly chosen out of the total 27 sectors) of Wah Cantt. The WHO sample size calculator was used, with the following assumptions of knowledge regarding antibiotic 57%, Confidence level of 95% and 5% Absolute precision required. Ethical approval was obtained from the ethical review committee of National University of Medical Sciences (NUMS), Pakistan. The sampling frame was obtained from station headquarters, Wah Cantt after taking permission from local authorities. Data were collected systematically from every fifth house from the first person contacted who fulfilled the eligibility criteria. Participants were included if they were 16 years old or older, were able to read Urdu or English language, and were mentally and physically capable of answering. A validated, closed-ended World Health Organization (WHO) questionnaire, previously used by WHO in a multi-country survey was administered both in English and Urdu languages (Urdu translation was evaluated using the standard forward and backward method).

The total number of participants who completed the questionnaire were 400 and data were entered and analyzed using SPSS-22. Mean and SD were calculated for continuous variable. Categorical variables were presented by frequency and percentage. Cross-tabulation was done

to determine the association between level of knowledge around the appropriate use of antibiotics, when to discontinue antibiotics course and the conditions/illnesses antibiotics treat. Chi-square test of significance was applied to determine the relationship of social variables with dependent variables, *p*-value <0.05 was taken as significant.

RESULTS

A sample of adults aged 16 years and older completed the survey with a total of 400 respondents. Of the total, 239 (59.8%) were males. Mean age was 37.52 ± 10.09 years. The minimum age was 16 and the maximum age recorded was 72 years as displayed in table-I.

To assess the appropriate use of antibiotics two statements were to be identified from the respondents as true or false as shown in table-II.

The first statement "There is no harm in using the antibiotics that were given previously to a family member or friend for the same purpose."Most of the respondents correctly

Table-I: Socio-demographic characteristics of study participants (n=400).

Variable	Number (N)	Percentage
Gender		
Male	239	59.8
Female	161	40.2
Age Groups		
16-24 year old	29	7.2
25-34 year old	145	36.3
35-44 year old	127	31.8
45-54 year old	79	19.8
55-64 year old	13	3.3
65 plus	7	1.8
House Hold Composition		
Single adult only	70	17.5
Single adult and at least one child under 16	11	2.8
Married adults only	71	17.8
Married and at least one child under 16	132	33.0
Multiple adults aged 16 and above	55	13.8
Multiple adults and at least one child under 16	61	15.3
Education		
Primary or middle	73	18.3
Secondary or higher secondary	140	35.0
Bachelor's or equivalent	126	31.5
Master's or equivalent	61	15.3
Occupation		
Government employees	140	35.0
Businessmen / private employees	109	27.3
Doctors	23	5.8
Other professionals (teachers, engineers etc.)	69	17.3
Students	32	8.0
Jobless / retired / housewives	27	6.8
Monthly House Hold Income in Pakistani Rupees (PKR)		
First\poorest Quintile (<20000 PKR)	88	22.0
Second Quintile (>20000 <30000 PKR)	178	44.5
Third Quintile (>30000 <40000 PKR)	48	12.0
Fourth Quintile (>40000 <65000 PKR)	40	10.0
Fifth\richest Quintile (>65000 PKR)	46	11.5

identified this first statement as false 243 (60.8%), with 114 (28.5%) wrongly identifying it as true. Forty three (10.8%) didn't know whether it's a true or false statement (X^2=2.93, p=0.087).

People in 55-64 year-olds category 10 (76.9%) were more to correctly identify the statement as false, with 0 (0%) wrongly identifying as true and 3 (23.1%) saying they didn't know. In other age categories 16-24 years old, 14 (48.2%) were more to correctly identify the statement as false, with 12(41.3%) wrongly identifying as true and 3 (10.4%) saying they didn't know. In 25-34 age group, 85 (58.6%) were more to correctly identify the statement as false, with 50 (34.4%) wrongly identifying as true and 10 (7%) saying they didn't know. In 35-44 age group, 53 (41.7%) were more to correct identify the statement as false, with 65 (51.1%) wrongly identifying as true and 9 (7.2 %) saying they didn't know. In 45-54 years old, 35 (44.3%) were more to correctly identify the statement as false, with 40 (50.6%) wrongly identifying as true and 4 (5.1%) saying they didn't know. The age category 55-64 has been discussed above. Respondents in the age category 65 plus years, 3 (42.8%) correctly identify the statement as false, with the same percentage 3 (42.8%) wrongly identifying as true and 1 (14.4%) saying they didn't know the answer. There was no statistically significant association between the inappropriate use of antibiotics and age groups (X^2=10.670, p=0.384). There was no statistically significant association between the inappropriate use of antibiotics and household composition (X^2 = 13.236, p=0.211) but level of education was highly statistically significant (Chi-square=57.105, p<0.001).

Table-II: Appropriate use of antibiotics.

Questions to assess knowledge of appropriate use of antibiotics	Responses by Frequency and Percentage			
	True	False	Don't know	Total (n=400)
There is no harm in using the antibiotics that were given previously to a family member/friend for the same purpose	114 (28.5%)	243 (60.8%)	43 (10.8%)	400 (100%)
Buying or asking from a doctor for the same antibiotics which were previously used to treat the similar symptoms.	153 (38.3%)	205 (51.2%)	42 (10.5%)	400 (100%)

Table-III: Responses to condition not requiring antibiotics in relation to household composition and level of education.

Household Composition	Responses to "Cold & Flu should be Treated with Antibiotics."			
	True	False	Don't know	Total (n=400)
Single adult only	37	26	7	70
Single adult & at least one child <16	2	9	0	11
Married adults only	46	19	6	71
Married & at least one child <16	67	59	6	132
Multiple adults aged 16 and above	25	29	1	55
Multiple adults & at least one child <16	35	23	3	61
Total (n=400)	212	165	23	400
Chi square = 21.543, p=0.018				
Level of Education	**True**	**False**	**Don't know**	**Total (n=400)**
Primary/Middle	58	13	2	73
Secondary / higher secondary	90	43	7	140
Bachelor's or equivalent	47	71	8	126
Master's or equivalent	17	38	6	61
Total (n = 400)	212	165	23	400
Chi square = 56.273, p<0.001				

The second statement "Buying or asking from a doctor for the same antibiotics which were previously used to treat the similar symptoms is the right thing to do." Almost half of the participants (205, 51.2%) agreed that this was a false statement. More females 100 (62.1%) correctly identified the statement as false but

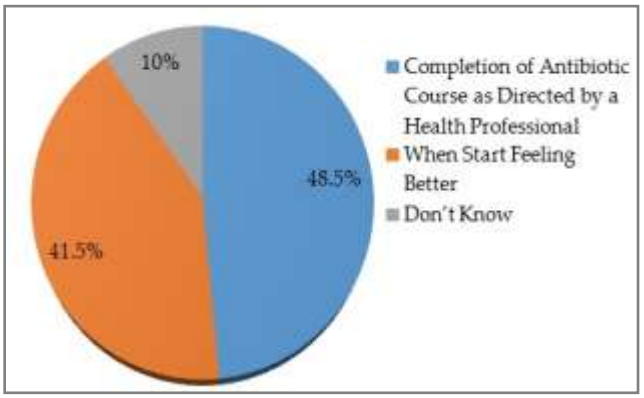

Figure-1: Responses to discontinuation of antibiotic treatment (n=400).

there was no statistical difference in relation to gender (Chi-square=2.998, p=0.223). The notable difference by age showed that older respondents (aged 65 plus (57.1%)) correctly identified the above statement as false (correct identification) as compared to 12 (41.4%) of younger age group 12 (16-24-year-olds). There was no statistical association between the house-hold composition (Chi-square=13.917, p=0.175). The respondents from the richest quintile were more likely to correctly identify the second state-ment as false 35 (75%), in comparison to poorest wealth quintile 36 (41%). The chi-square value (34.206) gives a statistically significant p-value <0.001.

The survey respondents were asked when they should discontinue or stop taking antibiotics once the treatment began (the options included when taken all the antibiotics as directed, when feeling better, didn't know) as shown in fig-1.

The response that a full course of antibiotics should be taken a directed was given by 194 (48.5%) of the respondents out of the total 400. More males 118 (49.4%) said that the course should be completed as directed but the association was statistically insignificant in relation to gender (Chi-square=1.757, p=0.415). The age group 16-24 year-olds were the highest in saying that the course should be discontinued when feeling better 20 (69%). The relation to the responses to age groups was statistically insignificant with a Chi-square value of 15.612, p=0.11. The difference between the responses to discontinuation of antibiotic with household composition (Chi-square=22.723, p=0.012), level of education (Chi-square=46.352, p<0.001), occupation (Chi-square=25.016, p=0.005) and monthly income (Chi-square=38.714, p<0.001) came out to be statistically significant.

To assess knowledge about the antibiotic use participants were asked about the medical conditions that do not require antibiotics as a treatment. Respondents were asked to identify (with the options True, False, don't know) all the illnesses mentioned in the list (cold & flu, fever, measles, malaria, body aches, HIV/AIDS, Headaches) that do not require antibiotics as

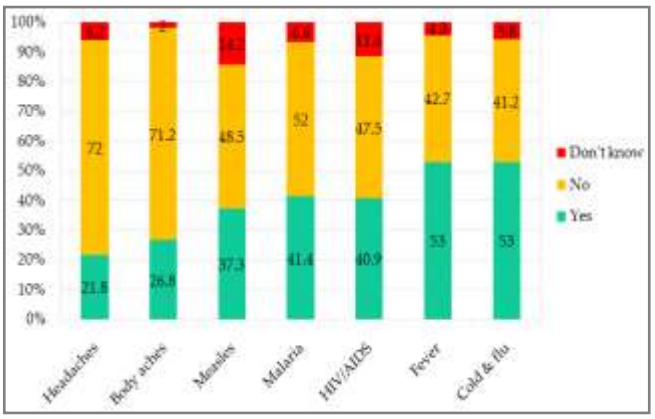

Figure-2: Responses to conditions not requiring antibiotics (n=400 for each category).

shown in fig-2 (data have been arranged in ascending order).

The relationship with social determinants was assessed for cold & flu as large number of participants mistakenly thought that cold and flu 212 (53%) which is usually viral and does not respond to antibiotics could be treated with these medicines. More males 133 (56%) incorrectly identified cold & flu (the condition of viral origin) requiring antibiotic treatment. Though the diffe-

rence between the responses in relation to gender was not statistically significant (Chi-square= 5.021, *p*=0.081). Respondents aged 45 and older are more likely to give the correct answer, and the relation was statistically significant (Chi-square=25.307, *p*=0.005). Respondents who were more educated showed higher percentage in identifying the condition (cold and flu) not requiring antibiotics as 38 (62.3%) in master's and 71 (56.3%) in bachelors category correctly identified it as false. The association for house-hold composition (Chi-square=21.543, *p*=0.018) and level of education (Chi-square=56.273, *p*<0.001) are shownin table-III.

DISCUSSION

High prevalence of antibiotic use is a public health concern of many communities and have been documented in countries like China, India, Greece, Saudi Arabia, and Australia[19]. The results of the appropriate use of antibiotics indicate relatively high levels of misunderstanding. The false statement that "there is no harm using the antibiotics that were given previously to a family or friend for the same purpose." was correctly identified by only 243 (60.8%) as a false statement. In a similar study conducted in Nigeria, 37% believe it to be a correct statement[20]. In Egypt, 34% thought it to be an accurate statement[20]. In a survey done in Saudi Arabia, 44.7% reported that they kept left-over antibiotics for future needs by discontinuing the antibiotic course of treatment[19]. Respondents were asked to indicate whether they thought the statement "Buying or asking from a doctor for the same antibiotics which were previously used to treat the similar symptoms" was true or false. Though there is considerable variation in the findings between other countries. Only 10% of participants in Barbados think the statement is true; this rises to 37% in Nigeria[7].

When to stop the antibiotics course once the treatment begins is another important factor which contributes to responsible antibiotic use. According to WHO patients should seek advice from a certified health professional and always complete the full course of antibiotics which are required to stop the growth of all bacteria[7,20]. Though the new studies discourage prolonged antibiotic therapy which might be detrimental because it facilitates colonization with antibiotic-resistant bacteria but completion of prescribed (can be a limited antibiotic dose), course of antibiotics as directed by a health professional is essential.

In this study, the findings of the understanding of when to stop taking antibiotics were quite low. Less than half that is 194 (48.5%) people believed in the completion of the full course of antibiotics. A cross-sectional survey study that was conducted in UK showed 99% in taking antibiotics as prescribed[21]. However, the knowledge about when to discontinue the antibiotics was quite small in Wah as compared to findings in other countries except for Sudan where 62% believed that they should stop taking antibiotics once started feeling better[7]. In another study conducted in Saudi Arabia, 71.1% reported they did not finish the antibiotic course as they felt better whereas the result was high (85%) in a study done in affluent areas of London[19,21].

Respondents were given the list including conditions that cannot be treated with antibiotics which they were to identify as true or false. The results of our study indicate that misunderstanding around this is widespread. A study done in Kosovo showed that flu (23.8%) and fever (20.2%) are treated with antibiotics[22]. A survey done in in Sudan, Egypt and India showed that more than three-quarters of participants think colds and flu which aren't of bacterial origin can be treated with antibiotics[7]. In a study done in Georgia, 55% of the respondents believed cold and flu to be treated by antibiotics which were similar as in this study[23].

The study results indicate that more than half of the respondents took antibiotics for common cold (53%). These findings were well correlated with the results of studies from many other countries including Poland (40%), China (54%), and India (74%)[5,7,18]. But a recent cross sectional

survey study conducted in UK showed that only 19% of the people believed that 'antibiotics help cure the common cold, cough and flu' , 81% disagreed with this statement[21]. In Malaysia, 38% of the respondents would take antibiotics for a cold, compared to 27% in US, 17% in Hong Kong and 3% in Australia[22]. The need to raise awareness about the issue of antibiotic resistance in Pakistan is very important. Surveys around the world have shown positive trends in knowledge, attitude, and behavior after educational campaigns which have led to appropriate consumption of antibiotics[5,24]. A drop in self-medication with antibiotics for colds and coughs from 10.8% in 1999 to 7.4% in 2004 was achieved as a result of educational campaigns in Australia[5].

CONCLUSION

The study results indicated that young people and those with a lower level of education and socioeconomic profile lacked the knowledge more than any other group.

RECOMMENDATION

The underlying principle of "use antibiotics when necessary and as required", needs to be stressed on young people, those with a lower level of education and socioeconomic profile as better knowledge is associated with correct behavior of antibiotic use.

CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

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