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Self-medication with antibiotics

Practices among Pakistani students in Sweden and Finland

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KHAN RIZWAN: *SELF-MEDICATION WITH ANTIBIOTICS -- PRACTICES AMONG PAKISTANI STUDENTS IN SWEDEN AND FINLAND*

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Background: Self-medication with antibiotics is a global phenomenon and potential contributor to human pathogen resistance to antibiotics. Amongst Pakistanis, antibiotic self-medication rates are high. At present, no data is available on prevalence and practices of self-medication with antibiotics among Pakistani students abroad.

Aim: The aim of this study was to assess prevalence and comparative practices of Pakistani students in Sweden and Finland regarding self-medication with antibiotics.

Methods: The study used an anonymous cross-sectional Web-based questionnaire survey with convenience census sampling targeted to Pakistani students in Sweden and Finland. Questionnaire asking use of antibiotics and six-month recall of antibiotic self-medication before the survey was administered to the 9333 potential respondents. Data was analyzed using statistical software R version 2.8.1. Descriptive statistic was used to analyze the results. Associations were tested using Pearson's Chi-squared test.

Findings: Response rate was 2.3% after five reminders. Of 213 participants (mean age 27.9 years), 151 were from Sweden and 57 were from Finland. One hundred eleven (52.1%) reported antibiotic self-medication in their life time and forty two percent knew that it could be injurious to health. Sixty-eight participants (31.9%) did self-medication with antibiotics during their stay in the study countries and almost all used oral antibiotics. Unrestricted pharmacy sale was the commonest source (37%) of such antibiotics. Common symptoms triggering antibiotic self-medication were respiratory (42.6%) and oro-dental (13.2%). Preferred antibiotics were broad spectrum Penicillin (41.2%), Macrolides (23.5%) and Quinolones (6.2%). Almost all (98.8%) antibiotics for such medication were obtained from Pakistan. About 27% reported that they would consider self-medication with antibiotics in future. The most common reason for antibiotic self-medication was affordability of health care consultation and antibiotics (23.9%). There was no significant difference between the self-medication practices of participants based on country of studentship ($p=0.6$). Self-medication rates were not significantly lower in students who were aware that it may harm ($p=0.2$) and is unsafe ($p=0.2$).

Conclusion: High prevalence of self-medication with antibiotics among participants is a matter of concern from individual and public health perspective. There is need to augment awareness and implement legislations to promote judicious and safe practices. Further studies are needed concerning resistance impact of antibiotic self-medication.

Key words: self-medication, antibiotics, Pakistani students, abroad, practices

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APPENDIX – I : ONLINE SURVEY QUESTIONNAIRE

1. INTRODUCTION

Antibiotics are revolutionary therapeutic agents for microbial eradication (Mainous et al., 2008). Unfortunately, despite public awareness and concern of health care providers, global irrational use of antibiotics is on a rise (50% to almost 100%) (Gaash, 2008, Filho et al., 2004, Zafar et al., 2008). Rampant irrational use of antimicrobials without medical guidance may result in greater probability of inappropriate, incorrect, or undue therapy, missed diagnosis, delays in appropriate treatment, pathogen resistance and increased morbidity (Matuz et al., 2007, Guillemot et al., 1998, Parimi et al., 2004, Hamel et al., 2001). Emergence of human pathogen resistance to antibiotics, both due to over and under use, is potentially dangerous for both individuals and societies (Matuz et al., 2007, Kristiansson et al., 2008, Sahoo., 2008).

‘Self-medication has been defined as obtaining and consuming drugs without the advice of a physician either for diagnosis, prescription or surveillance of treatment’ (Montastruc et al., 1997, Zafar et al., 2008). In majority of economically deprived countries, nearly 60-80% of health related problems are treated through self-medicated as lower cost alternative (Awad et al., 2007, Abay et al., 2010). Self-medication particularly with antimicrobials is a phenomenon of increasing global relevance. The utilization of antibiotics without prescription is motivated by a complex set of factors, worth mentioning are unchecked sales, economic and time constrains, influence of family and friends, consumer attitudes and expectations and media campaigns (Rowe et al. 2005, Kristiansson et al., 2008, Barros et al., 2009, Abay et al., 2010).

In Pakistan, like many other medicines, antibiotics are easily accessible to everyone without a prescription, a phenomenon seen in many economically deprived countries (Chang et al., 2003). Over the years, implications of self-medication especially with antibiotics have gained increasing recognition globally and likewise in Pakistan (Sawalha, 2008a, Nalini, 2010).

In Pakistan, few studies have investigated the phenomenon of self-medication. Very few surveys carried out to assess antibiotic self-medication practices in Pakistan reported prevalence as high as 35.2%-42% among students and between 6.3 to 51.3% in the

community (Zafar et al., 2008, Haider et al., 1995, Sturm et al., 1997, Butt et al., 2005, Hussain et al., 2008). The available studies did not include Pakistani students abroad, who differed from the general population and students in Pakistan in many aspects. Being abroad, they expose to different conditions related to health and diseases and different health care system, so they might be expected to behave differently. To the knowledge principal investigator, so far, there is no published data addressing self-medication with antibiotics and the factors affecting such practices among Pakistani students studying abroad.

This study aimed to assess the prevalence and differences in antibiotic self-medication practices among Pakistani students studying in two European countries including Sweden and Finland. Due to paucity of data on this subject, appropriate public and international health measures could not be planned. This data on self-medication may support intervention projects that seek to improve student practices in this regard.

2. AIMS

The overall aim of the study was to describe the antibiotic self-medication practices among Pakistani student studying in Sweden and Finland and to propose strategies to address this issue.

Specifically, the aims of this study were:

- To estimate the prevalence of self-medication with antibiotics among Pakistani students studying in Sweden and Finland; and
- To compare the differences regarding antibiotic self-medication practices between Pakistani students studying in Sweden and Finland.

3. MATERIAL AND METHODS

This was a cross-sectional comparative survey, carried out with web-based self-administered anonymous questionnaire. Study is based on the data collected from 24-12-2009 to 05-02-2010 in two countries of Western Europe i.e. Sweden and Finland.

3.01 Definitions

3.1.1 Self-medication

Self-medication is defined as *“the use of drugs to treat self-diagnosed disorders or symptoms without prescription, or the intermittent or continued use of a prescribed drug for chronic or recurrent disease or symptoms or sharing medicines with relatives or members of one's social circle or using leftover medicines stored at home”* (Abasaheed et al., 2009, WHO, 2000, Awad et al., 2005). Self-medication has also been defined as *“obtaining and consuming drugs without the advice of a physician either for diagnosis, prescription or surveillance of treatment”* (Montastruc et al., 1997, Zafar et al., 2008).

3.1.2 Antibiotic

An antibiotic was defined as *‘a medicine or substance that fights infections caused by bacteria and other microorganisms. It kills or inhibits the growth of bacteria and other microorganisms’* (Oxford concise colour medical dictionary, 2004, emedicinehealth, 2010, MedicineNet.com, 2010).

3.1.3 Web-based survey

The term ‘electronic survey’ or ‘e-survey’ has been defined as *‘a survey in which a computer plays a key role in both the delivery of a survey to potential respondents and the collection of survey data from actual respondents’*. Web-survey, a kind of electronic survey, is one that can only be accessed through a Web-browser as the survey physically resides on a network server (Jansen et al., 2007, Pulakka, 2009).

3.1.4 Student

In this study, students were defined as those Pakistanis who had current enrollment or had completed studies in bachelors, masters or doctoral degree program in any institute of higher education including vocational institutes in Sweden or Finland.

3.02 Study site

The study was carried out online among those Pakistani students who were studying at the time of survey or had completed their studies in institutions of higher education in the survey countries.

3.2.1 Study countries and educational institutions

Sweden and Finland are neighboring Nordic countries. Sweden has an area of 450,000 square kilometers and population of about 9.3 million. It has 48 accredited institutions of higher education, which offer over 500 programs in English. About 30,000 foreign students, including students from Pakistan, are currently studying in Sweden. (Sweden.Se, 2010a,b,c,d). On the other hand, Finland has an area of about 338,424 square kilometers and population of about 5.4 million. It has 16 universities and 25 polytechnics, which offer over 340 study programs in English. About 14,000 international students, including Pakistani students, are studying in Finland. (CIMO, 2011, This is Finland, 2011, Study in Finland, 2011).

The countries were chosen for survey because both were Nordic, had almost similar weather and above all offer free higher education to international students. During last few years, the study countries have become popular destination for Pakistani students because of high quality free education. This survey offered the advantage of comparative study among students from Pakistan regarding their antibiotic self-medication practices in the two survey countries.

3.03 Study population and participants

The target population consisted of Pakistani students who came to these countries for studies. Currently enrolled and those who had already completed their education were invited to participate in the survey.

3.3.1 Inclusion criteria

Inclusion criteria for the respondents of the survey were as follows:

- Pakistani students enrolled in any institute of higher education in the survey countries and members of one of the Yahoo groups included in the survey
- Pakistani students already completed studies from any institute of higher education in the survey countries and members of one of the Yahoo groups included in the survey
- Willing to participate in the study

3.3.2 Recruitment of participants

This was a convenience census survey. The study population included current and old Pakistani students and members of one of the selected Yahoo groups for Pakistani students in survey countries who met all the inclusion and none of exclusion criteria. These Yahoo groups are socialization networks operated by Pakistani students and for Pakistani students in the survey countries. The information of intended Yahoo groups was gathered from the relevant internet Yahoo group pages. The active Yahoo groups with higher number of member and accessible to the investigator was included. Being registered student in both survey countries, the researcher was member of all the groups selected for survey.

Yahoo groups managed and run by Pakistani students in the survey countries that were included in the survey are given in table I and II. Tables also elaborate email address of each group and its membership detail as was on the day of start and closing of survey.

In total, there were 6100 members of Yahoo groups in Sweden and 3233 members of Yahoo groups in Finland. Therefore, the intended study population included 9333 members of Yahoo groups. Study questionnaire was sent to all intended participants via their Yahoo groups during the study period from 24 December 2009 to 05 February 2010.

In this study, students were recognized as from Sweden and Finland based on their place of reported studentship. In the survey countries, all students were recruited through their respective Yahoo groups as mentioned in Table I & II. Students who were not members of selected Yahoo groups could not be approached individually hence excluded. Students who were member of other Yahoo groups, not included in the survey and inaccessible to investigator, were also excluded from the survey.

Table 1: Yahoo groups in Sweden and their membership details

Name of group	Email address	Members as on 24-12-2009 (survey start)	Members as on 05-02-2010 (survey end)
paksweden	paksweden@yahoogroups.com	1460	1498
Pakistani_Students_in_Sweden	Pakistani_Students_in_Sweden@yahoogroups.com	1580	1640
swedenpk	swedenpk@yahoogroups.com	987	989
swedenpk-café	swedenpk-café@yahoogroups.com	686	687
stockholmpk	stockholmpk@yahoogroups.com	1269	1286
	TOTAL MEMBERSHIP	5982	6100

Table 2: Yahoo groups in Finland and their membership details

Name of group	Email address	Members as on 24-12-2009 (survey start)	Members as on 05-02-2010 (survey end)
studyinfinland	studyinfinland@yahoogroups.com	1962	2013
PakistanStudentAssociation_Finland	PakistanStudentAssociation_Finland@yahoogroups.com	660	681
pinfin	pinfin@yahoogroups.com	455	457
paktampere	paktampere@yahoogroups.com	82	82
	TOTAL MEMBERSHIP	3159	3233

3.04 Methods used in this study

3.4.1 Study questionnaire

A semi-structured questionnaire, developed and pilot tested by the principal investigator, was used as survey tool. The questionnaire consisted of four sections containing both

closed- and open-ended questions. The first section included information for the participants to the survey. The second section consisted of 14 questions asking background information of respondent. The third section contained 13 questions related to use of antibiotics. The last section had 11 questions inquiring about self-medication with antibiotics in Sweden/Finland. The language of questionnaire was English and respondents answered it in English.

The web-based questionnaire was constructed with Gmail document using Gmail account of the principal investigator (pediatric.professionals@gmail.com). Invitation to participate was sent to the target Yahoo groups and after approval from the respective mediator, questionnaire was posted on the relevant Yahoo group, thus all the members received an email with a web-link to the survey questionnaire in their email inbox. The questionnaire was sent to the study population via a Web-link as: http://spreadsheets.google.com/viewform?formkey=dHh0eWhq_dkhaVHJjUIN1bzQ5_d0dRYmc6MA. Using the link all respondents answered the questionnaire by checking the relevant boxes or filling in the blank spaces provided to answer. Answering to the survey questionnaire was estimated to take around 30 minutes.

The study questionnaire assessed prevalence and comparative practices of Pakistani students regarding self-medication with antibiotics in Sweden and Finland.

3.4.2 Survey

This survey was carried out online by the principal researcher during December 2009 to February 2010. In this survey, information was obtained by using web-based self-administered anonymous questionnaire.

Every eligible participant was sent the study questionnaire along with a brief written description about the survey. The invitation to participate, having a web-link to the study questionnaire, was posted on the target yahoo groups (Table I and II) mediated by Pakistani students in Sweden and Finland. After approval from the mediator of the group, it was posted to respective Yahoo group and thus sent to all members for participation. In total, five reminders were sent to all potential participants through their respective Yahoo groups. Students who did not respond the study questionnaire one week after the 5th

reminder, irrespective of the reason, were excluded from the study. There was no new entry after closing of survey. Filled returned questionnaires served as consent to participate in the survey. Furthermore, all participants were assured that they will remain anonymous and the data will be used only for the study purpose.

3.4.3 Methods used for protecting against bias

It has been argued that imprecise and poorly designed questions may result in bias particularly if respondents fail to impart truthful answers due to misunderstandings and misinterpretations (Boynnton et al., 2004, Pulakka, 2009). In this survey, questions were designed in such a way that they should be understandable to the planned study population without any trouble. Transparency of questions and the technical functioning of the web-based questionnaire were tested and confirmed before launching the survey. A number of alternatives were given to respondents to clarify their answers especially for multiple option questions.

A pilot study was conducted from 1st to 8th November 2010 with 10 respondents that included currently enrolled and old Pakistani students in Stockholm. All the respondents of this pilot answered to pen and paper version of questionnaire. Questionnaire used in the pilot survey had added space for comments by the respondents. In addition, the pen and paper version of questionnaire was taken as group work assignment and discussed with the participants and teachers of 'Rationale use of drugs especially antibiotics' course at Karolinska Institutet Sweden between 16th and 20th November 2009. Finally, one professor who is supervisor of this study, with long experience of working with antibiotic research reviewed the questionnaire sent through email and gave her comments. Questionnaire was revised and finalized based on feedback of respondents of pilot, participants and teachers of 'Rationale use of drugs especially antibiotics' course and supervisor of the study. The pen and paper version of questionnaire thus finalized was then converted to electronic one using gmail account of investigator. Before posting survey online, the investigator confirmed smooth working of electronic questionnaire.

In this survey, utmost efforts were made and measures were taken to enhance the response rate as low response rate has been regarded as a source of bias in surveys (Braithwaite, 2003, Wakley, 2005, Pulakka, 2009). It has been reported that reminders

have proved effective in increasing the response rate in surveys including web-based surveys (Asch et al., 1997, Beebe et al., 2007, Braithwaite et al., 2003, Edwards et al., 2002, Pulakka, 2009). In this survey, all potential respondents were given five email reminders at weekly intervals with a link to survey questionnaire every time. It has also been reported that improved design of the questionnaire can also help in increasing the response rate, such as by starting with easy to answer questions (Pulakka, 2009). This technique was taken into consideration while preparing questionnaire for this study but the usual format of the web-based questionnaire could not be influenced a lot. Designing the questionnaire with Gmail account helped in making it clearer. Questions of sensitive nature are regarded as a reason associated with poor response rate, so this questionnaire avoided such questions (Edwards et al., 2002, Pulakka, 2009).

It has been argued that making a contact to potential respondents before sending survey questionnaire may prove beneficial in increasing response rate (Edwards et al., 2002, Pulakka, 2009). All potential respondents were contacted, by sending an email through their respective Yahoo group, with an invitation to take part in the Web-survey. This was to tell them about the study and thus an attempt to increase the response in the survey.

In order to reduce bias, integration of some of the technical properties of the Web-based questionnaire and survey was made. Questionnaire number 1 was made compulsory to get the valid university email address of the respondent, the only identification of respondent; this was to confirm the studentship and to avoid multiple responses from same respondent.

When participant responded the survey using web-link, data entry was made automatically into one Excel file connected to Gmail account of investigator. This automatic transfer of data occurred without labor-intensive measures and has the edge of preventing potential errors that can possibly be done in manual data entry (Braithwaite, 2003, Pulakka, 2009, Rhodes et al., 2003).

3.05. Sample size calculation and its justification

This convenience census survey was conducted among members of selected Yahoo groups that were operating for Pakistani students in Sweden and Finland during the period of survey. Before start of survey, popular Yahoo groups with higher number of

members, greater activity and accessible to investigator were identified and included so that sample would be representative. Yahoo groups mediated and operated by Pakistani students in Sweden and Finland that were included in the survey are given in table I and II.

3.06 Analytical approach

3.6.1 Variables in analysis

Self-medication with antibiotics among Pakistani students in survey countries was the outcome variable. Other variables in the analysis included gender, level of study program, area of Pakistan to which participant belong, professional background, health insurance, current health status, visit back Pakistan, duration of stay in survey countries, having antibiotics and antibiotics used during last 6 months. For the purpose of analysis, the study population was broadly categorized into two, those who reported studentship in Sweden and those in Finland.

3.6.2 Statistical analysis

Analysis was done using statistical software R version 2.8.1 (r-project.org, 2010). Mostly descriptive statistics was used. Analysis was conducted by calculating proportions and means for discrete and continuous data. Inferential analysis was done by using the Pearson chi square test to find associations among variables.

It is important to be highlighted here that the survey was descriptive and most results are summarized in counts and percentages, some of the questions had multiple options to choose from, total of percentages is not always 100%.

Firstly, general characteristics of the study participants were compared. A descriptive analysis was made between the participants from both countries to look at their background characteristics.

Secondly, calculated how many percent of the participants have used antibiotics in their lifetime and was that use prescribed or not. Further calculations were made to know how

many have done self-medication with antibiotics, how often did they do so and how many were aware of the fact that it may cause harm to health. It was further calculated that how many were satisfied with such experience, to how many it was safe and how many encountered side effects of such medication. In the end, calculations were made to know how many will continue such medication in future.

Thirdly, overall prevalence of self-medication with antibiotics among participants while in survey countries was calculated. Then, analyzed sources of antibiotics for such medication, for which symptoms they were consumed and through which route they were taken. Further calculations were made to know how many of them have used antibiotics for self-medication during last 6 months in the survey countries and which were those antibiotics.

Fourthly, results of open-ended questions, though very few, were in the form of qualitative data. This qualitative data was analyzed by identifying and denoting categories to them. Then, frequencies of answers fitted to the categories were calculated.

Finally, for comparison between groups by country of studentship, Pearson's Chi-squared test was applied and significance level was calculated. Further comparisons were made based on gender, degree cycle, area of Pakistan they belong, professional background, visit back Pakistan, duration of stay, health insurance and current health status. Here again Pearson's Chi-squared test was applied to find the statistical significance. A p-value of ≤ 0.05 was taken as statistically significant in all cases.

3.07 Data management

Investigator kept a record of contacts (Yahoo groups) that were made during recruitment of participants. Information collected was recorded into an Excel file that was saved in the personal computer, one pen drive and as email attachment of the investigator. The Excel file had information of the Yahoo groups contacted, their email address and their membership as on the date of start and closing of survey.

When the participants responded to the Web-based questionnaire using the web-link provided to them, one Excel data base file was created and saved automatically to the

gmail document in the gmail account of the investigator. On completion of survey, the created Excel file was copied to the personal computer of the researcher and was used for analysis.

3.7.1 Data cleaning

Although web-based survey ensured automatic data entry to an Excel file but could not avoid multiple responses and incomplete responses. In total, 264 responses were received to study questionnaire during the survey period from 24th December 2009 to 05th February 2010. These also included few multiple and incomplete responses. Multiple responses were those given by the same participant and with identical information, all such responses were identified and deleted. Responses were regarded incomplete if they did not give any information on use of antibiotics and antibiotic self-medication in the survey countries. Responses from ineligible participants, though very few, were also deleted. Because of exclusion of all such multiple, incomplete and ineligible responses, only 213 responses were finally included in the analysis. Unfortunately, about 9069 members of Yahoo groups could not be included in the study due to reason mentioned above and non-participation.

3.08 Ethical considerations

Approval for this web-based questionnaire survey was obtained from the School of Life Sciences at Södertörns University, Sweden.

As a member of most of the target Yahoo groups, investigator did not need any formal permission to post the survey questionnaire to the groups. The mediators of Yahoo groups, in the first instance, approved the email message having Web-link to the survey questionnaire sent by the principal investigator and then posted it to the relevant group. In this way, all members of the relevant Yahoo group got a web-link to survey questionnaire as email message in their email inbox.

Taking part in the survey was voluntary. All potential respondents were sent the study questionnaire along with a brief written introduction to survey, having a web-link to the study questionnaire. Answering the questionnaire was considered to be consent to take

part in the study and informed consent was not asked separately. No monetary incentive was given to the respondents. The only identifying item was Email address so was detached from the responses after data cleaning and preliminary analysis to make sure the anonymity of the respondents. Respondents were also ensured that the data would be used for the study purpose only.

3.09 Funding and budget

Funding for designing and implementing of this survey was the responsibility of principal investigator. Using personal laptop hp 530, principal investigator developed the questionnaire in his accommodation and university computer room. Investigator used his own Gmail account (pediatric.professionals@gmail.com) for developing this Web-based questionnaire survey. Internet service, Warid WIFI Pakistan, was used to send the Web-based questionnaire to potential respondents and was paid by the principal researcher.

Investigator paid the costs of printouts and photocopies taken at the Karolinska Institutet and Södertörns University, during the process of developing and pilot testing of the survey questionnaire. The researcher himself conducted the survey and did the data management.

4. RESULTS

In total, 9333 members of Yahoo groups were approached online in the study countries through their respective Yahoo groups. Among these, 264 responded to the survey questionnaire and 213 were included for analysis. Unfortunately, 9120 members could not be included due to reasons of non-participation in the survey and 51 respondents were excluded due to the reasons of double or incomplete responses.

4.01 Characteristics of study participants

Out of 213 participants, majority (96.7%) were males. The remaining female participants were all studying in Sweden. Median age of the participants was 27 years (range 21-41). Only 2.3% participants reported studentship in both survey countries. Majority of participants (58.2%) belonged to province Punjab of Pakistan. During the survey period, a little less than two third of participants (64.3%) were residing in Sweden and less than one tenth (8.9%) were in Pakistan. Just over one third of participants (35.7%) arrived in the survey countries during the year 2009. A little less than half of participants (41.8%) reported that their duration of stay in the survey countries was up to one year. Just over half of the participants (53.3%) did not visit back Pakistan since their arrival in the survey countries. A little more than two-third of participants (69.5%) reported their studentship in master degree programs. Very few participants (12.7%) were from health care and related professions. About half of the participants (47.4%) were studying without doing any sort of work. Little more than one fourth of the participants (28.3%) claimed that they were not insured and a little less than one forth (22.1%) had private health insurance. Majority of the participants categorized their health status as excellent (45.1%) and good (48.8%). Due to greater number of participants from Sweden, percentage differences in participants from both the countries are appreciable. Characteristics of participants from the two countries are given in **Table-3**.

4.02 Past experiences of participants with antibiotic self-medication

Among 85% participants who had used antibiotics in their lifetime, almost every second (42.2%) reported un-prescribed use. One hundred and eleven (52.1%) participants cited

that they had used antibiotics through self-medication to treat their illnesses. About 28% (n=60) participants reported that they rarely used antibiotic through self-medication when they got sick. Little less than one-fourth (n=49) participants were completely satisfied with their experience of self-medication with antibiotics. Only about five percent of participants (n=12) ever encountered side effects with antibiotic self-medication, of these majority (58.3%) experienced gastrointestinal system related side effects. Less than one-fifth participants (n=35) were deciding, most of the time, on their own whether they need antibiotic for illness or not. Forty-two (19.7%) participants were of the view that self-medication with antibiotics is good while 48 (22.5%) were not sure about it. Just over one-fifth (n=48) participants were not sure whether self-medication is safe or not. Percentage differences in those who experienced self-medication as safe (17.4%) and unsafe (20.6%) were not appreciable. Ninety (42.2%) participants were aware of the fact that self-medication with antibiotics may result in adverse effects. Nearly one-fourth of the participants (n=57) reported that they would use antibiotics through self-medication in future. As far as sources of antibiotics for self-medication among participants were concerned; pharmacies were on the top (37%) followed by family (17%), friends (13.1%) and leftovers (8.9%). Percentage differences between participants from two countries regarding past experience of antibiotics use in general and through self-medication in particular are given in **Table-4**.

4.03 Antibiotic self-medication experiences of participants in study countries

Out of 213 participants, about one third (n=68) reported practicing self-medication with antibiotics during their stay in the study countries and almost all of these used oral antibiotics. Percentage differences were appreciable between those who did self-medication and had studentship in Sweden and Finland. Forty-three percent of female participants did self-medication with antibiotics compared to only 33% males. More master degree students (35%) did self-medication compared to those who were in doctoral (31.2%) degree program or completed their studies (28.6%). Those claimed to have good health did more (40.6%) self-medication compared to those with excellent (25.6%), average (30%) or bad health (33.3%). Participants who had Swedish national health insurance did almost two times more self-medication compared to their counterparts having Finnish national insurance (42% vs. 25%), even it was lower in those having no insurance (34.5%). Difference was not appreciable in practices of participants

from Punjab and Khyber Pakhtunkhwa regarding self-medication (36.4% vs. 35.5%). Non-healthcare related professionals (31.3%) did less self-medication compared to healthcare related professionals (48%). Percentage of those who did self-medication was highest (58.3%) among those who reported that they neither study nor work. Higher percentage (43.3%) of students did self-medication who stayed in study countries for 24-36 months compared to other groups [up to 12 months (28.1%); 12-24 months (40.8%); more than 36 months (28.6%)]. It is interesting that more participants who indulged in self-medication visited back Pakistan (60.3%) compared to those who did not do so (39.7%). Majority of those who self-medicated themselves did so for respiratory (n=29; 42.6%) and oro-dental (n=9; 13.2%) symptoms. Surprisingly enough, some participants used antibiotics for symptoms for example pain, stomachache, kidney stones, allergies, common cold and headache etc that probably do not require antibiotics. Mainly broad-spectrum Penicillin (n=28; 41.2%), Macrolide (n=16; 23.5%) and Quinolone (n=11; 6.2%) were the antibiotic classes kept and used by most of the participants.

It was interesting to appreciate that one-third (n=22; 32.3%) of those who did self-medication regarded non-antibiotic drugs as antibiotics, when they were asked about antibiotics used in the study countries. Nearly every fourth participant (n=88) reported to have antibiotics for self-medication and almost all (98.8%) got these antibiotics from Pakistan. Those who had antibiotics with them in the survey countries seemed to be more prone to self-medication (89.7 vs. 10.3). It is interesting to note that both who did not visit back Pakistan and those who did so have antibiotic stock with them (49.4% vs. 50.5%). Interestingly, out of those who had antibiotics with them, three-fourth (76.1%) was in master degree program and had studentship in Sweden. Majority of participants who had antibiotics with them reported their health status as good (59.1%) or excellent (34.1%). Negligible females (4.5%) had antibiotics with them in survey countries compared to males (95.5%). Six times more participants with Swedish National Insurance (37.5%) had antibiotics stock compared to those having Finnish National Insurance (5.7%). Majority of participants (56.8%) who belonged to province Punjab had antibiotics with them compared to those from other administrative areas of Pakistan.

During last six months before survey, of 53 (24.9%) who got sick in the study countries, 44 (83.0%) self-medicated themselves with antibiotics. Percentage differences between

respondents from two survey countries regarding antibiotic self-medication practices are given in **Table-5** and **6**.

4.04 Results of Pearson's Chi-squared test

There was no significant difference between the self-medication practices of participants based on country of studentship ($p=0.06$) and having stock of antibiotics ($p=0.08$). Self-medication practices of participants were not significantly affected by level of degree of studies ($p=0.7$), current health status ($p=0.28$), insurance status ($p=0.6$), gender ($p=0.8$), area of Pakistan they belong ($p=0.9$) and duration of stay in survey countries ($p=0.3$). Ironically, self-medication rates were not significantly lower in students who were aware of its harmful effects ($p=0.2$) and those who think it is not safe ($p=0.2$). There was statistically significant difference between self-medication practices of those who got sick during last 6 months and those who did not ($p=0.05$), healthcare and non-healthcare related professionals ($p=0.005$), and based on working status ($p=0.002$) in the survey countries.

Table–3: Characteristics of participants

Characteristic	Studentship in Sweden	Studentship in Finland
	(n=151) n (%)	(n=57) n (%)
Sex		
Male	144 (69.9)	57 (27.7)
Female	7 (100)	--
Belong to area of Pakistan		
Punjab	82 (66.1)	39 (31.5)
Khyber Pakhtunkhwa	21 (63.6)	12 (36.4)
Sindh	20 (80.0)	3 (12.0)
Balochistan	1 (100)	--
Gilgit Baltistan	1 (100)	--
Federal Capital Islamabad	23 (88.5)	3 (11.5)
Federally Administrated Tribal Areas	1 (100)	--
Present place of residence		
Sweden	137 (100)	--
Finland	-	52 (98.1)
Pakistan	10 (52.6)	5 (26.3)
Duration of stay in study countries		
Up to 12 months	71 (79.8)	18 (20.2)
More than 12 and up to 24 months	36 (65.5)	16 (29.1)
More than 24 and up to 36 months	25 (80.6)	6 (19.4)
More than 36 months	18 (50.0)	17 (47.2)
Visit back to Pakistan		
No	90 (79.6)	23 (20.4)
1-3 times	54 (65.1)	26 (31.3)
More than 3 times	6 (40.0)	8 (53.3)
Enrollment in degree program		
Bachelor	3 (33.3)	6 (66.7)
Master	115 (77.7)	29 (19.6)
Doctoral	19 (59.4)	12 (37.5)
Studies completed	14 (63.6)	8 (36.4)
Professional background		
Medical and health care	14 (51.9)	10 (37.0)
Non-health care related	137 (73.7)	47 (25.3)
Are you working?		
Only studying	80 (79.2)	20 (19.8)
Part-time working with university studies	47 (82.5)	8 (14.0)
Full time working with university studies	5 (25.0)	14 (70.0)
Full time working only	10 (45.5)	12 (54.5)
Not working or studying	9 (69.2)	3 (23.1)
Health insurance status		
Not insured	57 (93.4)	3 (4.9)
Swedish state health insurance	69 (97.2)	--
Finnish state health insurance	1 (4.2)	22 (91.7)
Private health insurance	18 (38.3)	28 (59.6)
Insured by employer	4 (50.0)	4 (50.0)
Self-perceived state of health		
Excellent	62 (64.6)	29 (30.2)
Good	76 (73.1)	28 (26.9)
Average	10 (100)	--
Bad	3 (75)	--

Table–4: Past experiences of participants with antibiotic self-medication

Variables		Studentship in Sweden (n=151)	Studentship in Finland (n=57)
		n (%)	n (%)
Ever used antibiotics for any illness in life	Yes	128 (84.8)	48 (84.2)
	No	23 (15.2)	9 (15.8)
Antibiotic use	Prescribed	72 (47.7)	31 (54.4)
	Un-prescribed	8 (5.3)	3 (5.3)
	Both	48 (31.8)	14 (24.6)
Ever used antibiotics through self-medication to treat any illness	Yes	80 (55.9)	27 (49.1)
	No	60 (42.0)	28 (50.9)
	Not sure	3 (2.1)	--
If you did self-medication with antibiotics, how often did you do that?	Always when sick	3 (3.2)	2 (6.9)
	Most of the time when sick	14 (15.1)	5 (17.2)
	Some times when sick	32 (34.4)	7 (24.1)
	Rarely when sick	44 (47.3)	15 (51.7)
Satisfaction with experience of self-medication with antibiotics	Completely satisfied	32 (32.3)	15 (45.5)
	Partially satisfied	46 (46.5)	12 (36.4)
	I do not know	11 (11.1)	1 (3.0)
	Partially unsatisfied	3 (3.0)	--
	Completely unsatisfied	2 (2.0)	--
	Not experienced	5 (5.1)	5 (15.2)
Ever encounter adverse / side effect of self-medication with antibiotics	Yes	8 (8.7)	4 (13.8)
	No	69 (75.0)	21 (72.4)
	Not sure	15 (16.3)	4 (13.8)
How do you decide that antibiotic is needed for your illness?	Always on your own	8 (8.6)	4 (13.8)
	Mostly on your own	29 (31.5)	3 (10.3)
	Some times on your own	27 (29.0)	9 (31.0)
	Rarely on your own	17 (18.3)	11 (37.9)
	Never on your own	12 (12.9)	2 (6.9)
Based on your practice, do you think self-medication with antibiotics is good?	Yes	33 (35.1)	7 (22.6)
	No	24 (25.5)	14 (45.2)
	Not sure	37 (39.4)	10 (32.3)
Based on your experience, do you think self-medication with antibiotics is safe?	Yes	27 (29.0)	8 (25.0)
	No	28 (30.1)	15 (46.9)
	Not sure	38 (40.9)	9 (28.1)
Do you know if self-medication with antibiotics may result in adverse / side effects?	Yes	63 (67.7)	23 (74.2)
	No	11 (11.8)	3 (9.7)
	Not sure	19 (20.4)	5 (16.1)
Will you continue using antibiotics for self-medication in future?	Yes	41 (42.7)	13 (41.9)
	No	23 (24.0)	7 (22.6)
	Not sure	32 (33.3)	11 (35.5)

Table–5: Antibiotic self-medication experiences of participants in study countries

Variables		Studentship in Sweden (n=151) n (%)	Studentship in Finland (n=57) n (%)
Any illness treated through antibiotic self-medication	Yes	53 (36.3)	12 (22.2)
	No	92 (63.0)	41 (75.9)
	Not sure	1 (0.7)	1 (1.9)
Have own stock of antibiotics for self-medication	Yes	67 (48.6)	18 (34.6)
	No	71 (51.4)	34 (65.4)
Route through which antibiotics were taken	None	52 (46.0)	16 (48.5)
	Oral	56 (49.6)	16 (48.5)
	Inject able	1 (0.9)	--
	Local	3 (2.7)	1 (3.0)
	All	1 (0.9)	--
Source of antibiotics	Only from Pakistan	71 (85.5)	12 (54.5)
	Only from Sweden	4 (4.8)	--
	Only from Finland	--	7 (31.8)
	From Pakistan, Sweden and/or Finland	4 (4.8)	2 (9.1)
Got sick during last 6 months before survey	Yes	45 (44.1)	8 (25.0)
	No	57 (55.9)	24 (75.0)
Antibiotics use for self-medication during last 6 months	Not at all	65 (64.4)	24 (75.0)
	1-3 times	35 (34.7)	7 (21.9)
	More than 3 times	1 (1.0)	1 (3.1)

Table–6: Antibiotic self-medication experiences of participants in study countries and characteristics of participants

Variables	Studentship in Sweden (n=151) n (%)	Studentship in Finland (n=57) n (%)
Sex		
Male	50 (94.3)	12 (100)
Female	3 (5.7)	--
Belong to area of Pakistan		
Punjab	31 (58.5)	10 (83.3)
Khyber Pakhtunkhwa	9 (17.0)	2 (16.7)
Sindh	4 (7.5)	--
Balochistan	--	--
Gilgit Baltistan	1 (1.9)	--
Federal Capital Islamabad	7 (13.2)	--
Federally Administrated Tribal Areas	--	--
Duration of stay in study countries		
Up to 12 months	21 (39.6)	4 (33.3)
More than 12 and up to 24 months	17 (32.1)	1 (8.3)
More than 24 and up to 36 months	9 (17.0)	4 (33.3)
More than 36 months	6 (11.3)	3 (25.0)
Visit back to Pakistan		
No	26 (49.1)	1 (8.3)
1-3 times	25 (47.2)	10 (83.3)
More than 3 times	2 (3.8)	1 (8.3)
Enrollment in degree program		
Bachelor	1 (1.9)	1 (8.3)
Master	40 (75.5)	7 (58.3)
Doctoral	6 (11.3)	3 (25.0)
Studies completed	6 (11.3)	--
Professional background		
Medical and health care	5 (9.4)	5 (41.7)
Non-health care related	48 (90.6)	7 (58.3)
Are you working?		
Only studying	25 (47.2)	2 (16.7)
Part-time working with university studies	17 (32.1)	2 (16.7)
Full time working with university studies	2 (3.8)	3 (25.0)
Full time working only	4 (7.5)	3 (25.0)
Not working or studying	5 (9.4)	2 (16.7)
Health insurance status		
Not insured	20 (37.7)	--
Swedish state health insurance	27 (50.9)	--
Finnish state health insurance	--	5 (41.7)
Private health insurance	4 (7.5)	7 (58.3)
Insured by employer	2 (3.8)	--
Self-perceived state of health		
Excellent	13 (24.5)	7 (58.3)
Good	36 (67.9)	5 (41.7)
Average	3 (5.7)	--
Bad	1 (1.9)	--

5. DISCUSSION

5.01. Aims and findings of the study

To our knowledge, this was the first survey ever conducted to investigate antibiotic self-medication practices among Pakistani students studying abroad. This study aimed to estimate prevalence/magnitude and comparative practices of Pakistani students in Sweden and Finland regarding antibiotic self-medication. The study further assessed self-reported use of prescribed antibiotics, as well as sources for obtaining antibiotics, reasons for self-medication, type of antibiotics consumed and keeping stock of antibiotics among students while abroad. This study also assessed common types of illnesses, frequently used antibiotics and determinants of self-medication. The long-term aim of the study was to get an overview of antibiotic self-medication among Pakistani students abroad which may help in planning future interventions to address this issue. Respondents were Pakistani students who were members of selected Yahoo groups operated by and for them in the survey countries. Indirectly, this study also determined the reasons for self-medication with antibiotics.

Among the 213 participants, 151 and 57 were from Sweden and Finland respectively. Participants from Sweden were more might be due greater number of courses offered in Sweden. Participants belonged to different administrative areas of Pakistan and were studying at different levels. Majority of participants were from non-healthcare related professions. There was preponderance of those who had a health insurance. Those who arrived in the survey countries more recently showed more interest in the survey might be due to their interest in the topic or being frequent user of Yahoo group services because of their needs.

Majority of participants (n=180; 84.5%) reported use of antibiotics in their lifetime. Self-medication with antibiotics to treat health problems was plausibly high among participants (52.1%) of this survey. Finding of this study showed that prevalence of antibiotic self-medication (31.9%) among Pakistani students in the survey countries is worrisome. Very few participants encountered harmful effects of such medication. To very few participants, self-medication with antibiotics was safe (17.4%) and 2.3% were

not satisfied with their experience of self-medication. In spite of the fact that every second participant was aware, that self-medication with antibiotics may be injurious to health; every fourth was expecting future self-medication. Pharmacies were the most common source of such antibiotics followed by family, friends and leftovers. Respiratory tract, oral and dental symptoms, pains, allergies and common cold were the widespread symptoms for such medication. Amoxicillin was the most in use antibiotic for self-medication.

Poor health, place of studentship, level of study, duration of stay in study countries, area in home country, gender and having health insurance and antibiotic stock did not seem to affect self-medication with antibiotic behavior of participants in the survey countries. Paradoxically, self-medication rates were not appreciably lower among participants who were aware of its harmful effects and knew it is unsafe. However, sickness during six months before survey, professional background and work status seemed to significantly affect antibiotic self-medication behavior of participants in the survey countries.

The students surveyed in this study represent a small but relatively privileged class of Pakistani population. Thus, it is unclear whether the responses of the surveyed students are representative of other students in Pakistan and Pakistani in Sweden and Finland who did not participate in the survey.

5.02 Validity of the results

This study addressed antibiotic self-medication practices of Pakistani students in Sweden and Finland. Convenience census survey among Pakistani students in Sweden and Finland irrespective of their antibiotic self-medication practices included the strength of this study.

5.2.1 Response rate and non-response bias

Over the years, response rate in surveys has always been a matter of concern for investigators. Response rate varies a lot, especially, in internet-based surveys (Braithwaite et al., 2003, Pulakka, 2009). Surveys on themes interesting to the potential participants

may help in increasing response rates (Pulakka, 2009, Edwards et al., 2002). The response rate in this study was extremely low (2.8%) where as *Zafer et al* in their survey, pen and paper version, among university students in Karachi, Pakistan got a good response rate of 95.3% (Zafer et al., 2008).

In this survey, all potential respondents were contacted six times, by sending an email through their respective Yahoo group along with a web-link to the survey questionnaire. This was an effort to increase the response. Potential respondents were given a reasonable time to participate, although those who got questionnaire later (in February 2010), had relatively less time than those who received it earlier in December 2009.

It has been discussed that response rate is an important indicator of level of success of a survey in collecting information from all eligible in a population or sample. Inability of some sample members to give the required information, disinterest of some sample members, non-existence of some members of the sample, refusal to participate due to any reason, failure to find and contact targeted members, physical and language limitations could be the grounds resulting in failure to get required information in a survey. Additionally, reluctance, stigma and shame associated with self-perceived low performance or dispersal of information may result in refuse to participate and non-response (Khan, 2009, Pulakka, 2009).

In surveys, response rate is regarded as an indirect indicator of non-response bias (Pulakka, 2009, Asch et al., 1997). In order to assess non-response bias investigators usually compare important variables of participants and non-participants (Cummings et al., 2001, Pulakka, 2009) In this study, high response failure is difficult to analyze because of Web-based self-administered anonymous nature of survey. Survey design makes it difficult to identify and get back to non-responders to explore their reasons of non-participation and to know their antibiotic self-medication practices.

In this study, one reason of non-response might be the ineligibility of most members of Yahoo groups in countries under survey. Some Yahoo groups might have allowed memberships to prospective students, so being ineligible they did not take part. Some others may be given membership as prospective student but could not get admission in study countries and thus discontinued using the group services. Some members, who have

already completed their studies, were no more active on these Yahoo groups during the survey, so did not take part. Some Pakistani students might have membership of more than one group thus adding to population. There is possibility that some members did not use the Yahoo groups during survey period, as they use such services mostly in need only, and thus could not get the questionnaire. There could be other members who were inactive due to any other reason for example traveling, at a place where internet is not available etc. Unfortunately, a larger number of students could not be included in this survey due to reasons mentioned.

Although all the potential participants were informed about anonymous nature of questionnaire but interestingly, some members of Yahoo groups showed their reservations in separate email messages to the principal researcher. This was because participants, initially, were asked to write their university email address to avoid multiple responses and to prove studentship. Some especially mentioned that they do not wish to participate due to the present circumstances in Pakistan and ongoing so-called extremism and apprehension of misuse of data. Although, afterwards, the participants were given the option not to mention their university email address, still there is possibility that participants were scared of participation.

5.2.2. Internal validity

To enhance the internal validity, a pre-tested semi-structured questionnaire was used as the survey tool. Investigator especially developed the survey questionnaire for this study in consultation with the supervisor of study. Firstly, the questionnaire was pilot-tested among ten Pakistani students in Stockholm, Sweden. Secondly, the questionnaire was discussed with the participants and teachers of 'Rationale use of drugs especially antibiotic' course at division of Global Health Karolinska Institutet Sweden. Respondents of the pilot, participants and teachers of 'Rationale use of drugs especially antibiotic' course gave their comments and suggestions to improve the questionnaire. In addition, supervisor of the study who is experienced in the field antibiotic research reviewed the questionnaire and gave her feedback. The comments and feedbacks were taken into account while finalizing the questionnaire. Clarity and consistency of answers showed that survey questions were easily understandable and transparent.

The study questionnaire was in English. All students coming to Sweden and Finland have to prove their English proficiency to get admission in institutes of higher education. Keeping issue of language barrier in mind, it was successfully addressed while developing study questionnaire. Further, to enhance the validity, terminologies like self-medication and antibiotic were explained to all the participants in the introduction to survey.

Questionnaire had both open- and close-ended questions. Open-ended questions and questions where participants could select more than one options, though very few, resulted in several answers showing that the respondent had interest in the subject. For categorized questions, the respondents were also given the options to clarify their responses; this helped in assigning answers to one category more precisely and accurately. This was an attempt to get better response rate and get clearer responses (Pulakka, 2009, Boynton et al., 2004, Wakley, 2005). These clarifications further helped in analysis of the survey data.

Proper functioning of web-link to the questionnaire and web-based survey was confirmed before sending questionnaire to the study participants. In total, five reminders were sent to the target population at weekly intervals, as reminders have been regarded effective in increasing the response rate in web-based surveys (Wakley, 2005, Pulakka, 2009, Asch et al., 1997, Edwards et al., 2002, Beebe et al., 2007, Braithwaite et al., 2003).

Some technical advantages of Web-based questionnaire helped in improving the quality of data collected. It has been argued that making few questions compulsory to answer in the Web-based surveys may limit missing responses (Pulakka, 2009, Rhodes et al., 2003). In this survey, only first question was compulsory. Design of this survey allowed automatic data transfer into Excel file thus eliminating data entry errors, this further ensured the quality of data (Pulakka, 2009, Braithwaite et al., 2003, Rhodes et al., 2003, Roberts, 2007).

All potential respondents were given reasonable time to complete the questionnaire, although those who got questionnaire later (in February 2010), had less time than those who received it earlier in December 2009.

5.2.3. External validity

The study population consisted of Pakistani students in Sweden and Finland who were members of Yahoo groups selected for this survey during the survey period. However, study respondents included only those who responded the Web-based survey questionnaire. Survey participants were only those who were eligible after data cleaning.

In Web-based surveys, a representative sample is a major factor of concern for investigators and thus the external validity of the survey. People having access to computer and internet facilities and technically skilled in using it may not be the representative of the general population, thus creating biasness in the sample (Pulakka, 2009, Braithwaite et al., 2003, Roberts, 2007). Statistics of usage of computer and Internet by Pakistani students in Sweden and Finland is lacking; but in fact all institutes of higher education in Sweden and Finland have computer and Internet facilities for students. Students, most often, have to use computer and Internet for their educational activities. This indirectly shows that computer and internet is extensively in use among students of higher education in the study countries including students from Pakistan. Furthermore, almost all Pakistani students in Sweden and Finland, who were members of target Yahoo groups, thought to have access to computer and Internet facility.

The aim of this survey and data collection was to include a representative population of Pakistani students in Sweden and Finland. While identifying potential participants, the search centered towards Yahoo groups working for Pakistani students in Sweden and Finland having higher membership, greater activity and accessible to the researcher. One criterion for inclusion was Yahoo groups having recent activities. Altogether, nine Yahoo groups including five from Sweden and four from Finland having 9333 members were represented in this survey. The Yahoo groups working for Pakistani students, that were excluded, had very few members and were mostly inactive or had little activity. Thus, the respondents perhaps do not stand for the overall Pakistani students in Sweden and Finland. The aim was, however, to find respondents that have practiced self-medication with antibiotics while studying in Sweden and Finland.

The survey countries were well represented in the survey. Out of 213 participants, 57 were from Finland.

None of the respondent reported any technical difficulties in using the link and responding the Web-based questionnaire, meaning thereby that participating in the Web-based survey was participant friendly.

Although response rate is very low and adequate data cleaning was done before analysis, there is theoretical possibility of multiple responses by some respondents using different email addresses or not disclosing email address, if enrolled in more than one institute/university. Keeping in mind very low response rate (2.8%), adequate data cleaning and only 5 respondents claiming to have dual studentship, this argument does not seems to influence the validity of this study.

5.03 Relation with earlier studies

Self-medication with antibiotics, a phenomenon practiced globally, is affecting both developing and developed countries. Worldwide, such human malpractice has resulted in inadequate dosing, incomplete courses and indiscriminate antimicrobial use and thus is thought to be associated with increase in the probability of inappropriate, incorrect, or undue therapy, adverse reactions, missed diagnosis, delays in proper treatment and pathogen resistance. Resultantly, the phenomenon has contributed to prolonged human sufferings in terms of morbidity and mortality (Al-azzam et al., 2007, Spellberg et al., 2008, Matuz et al., 2007, Guillemot et al., 1998, Parimi et al., 2004, Hamel et al., 2001, WHO, 2001, Awad et al., 2005, Verma et al., 2010).

Emerging pathogen resistance to antimicrobial, fueled by self-medication, is a real global problem (Chalker, 2001, Awad et al., 2005). To combat microbial resistance issues new antibiotics are under development. Development of new and even more expensive drugs to fight resistant microbes will further add to the problems of unprivileged particularly in resource-poor countries such as Pakistan. The rational use of antibiotics is thus of utmost importance to limit the emerging antimicrobial resistance.

5.3.1 Prevalence of antibiotic self-medication

This study demonstrated that an appreciably high percentage (31.9%) of Pakistani students had self-medicated themselves with antibiotics during their stay in the survey

countries where as the percentage of those who ever did so is even higher (52.1%). To the knowledge of investigator no such study, so far, has been reported among Pakistani students studying abroad, thus no data is available for comparisons. However, one study conducted among university students in Karachi Pakistan with comparable results reported prevalence of self-medication with antibiotics up to 35.2%. High prevalence of self-medication in general and with antibiotics is a universal problem and variations regarding such medications are obvious across the globe; Palestine (98%), Hong Kong (72.1%-94%), Slovenia (92.3%), Croatia (88%), Malaysia (80.9%), Greece (74.6%), Sudan (79.5% to 48%), China (59.4%), Turkey (45.8%), USA (43%), Jordan (40.7%), Lithuania (39.9%), Ethiopia (38.5%), India (31%) and Finland (28%). Interestingly, some lower rates have been reported in Malta (19.2%), Mexico (5%) and Sweden (3%). These variations could be due to differences in attitudes, literacy, environment, culture and legislation in these countries. Prevalence rate in this study is much lower compared to some other countries but still high enough to be taken seriously (Abay et al., 2010, Ali et al., 2010, Awad et al., 2005, Awad et al., 2007, Berzanskyte et al., 2006, Borg and Scicluna, 2002, Buke, 2003, Buke et al., 2005, Calva and Bojalil, 1996, Klemenc-Ketis, 2010, Lua et al., 1995, Mitsi et al., 2005, Nalini, 2010, Richman et al., 2001, Sawair et al., 2009, Sawalha, 2007, Sawalha, 2008a&b, Svensson et al., 2004, Tse et al., 1989, Vucic et al., 2005, Vaananen et al., 2006, Zafar et al., 2008).

5.3.2. Factors associated with antibiotic self-medication

Many studies have assessed factors that are associated with self-medication. One Nigerian study identified level of education as a major factor that influenced self-medication patterns (Afolabi, 2008). *Sapkota et al* further showed that a higher level of education is inversely associated with self-medication of antibiotics (Sapkota et al., 2010). One European study argued that respondents with low education are less aware of consequences of self-medication and thus more prone to practice it (Grigoryan et al., 2007). In this study, 35% master degree students did self-medication compared to those who were in doctoral (31.2%) degree program or completed their studies (28.6%). Thus revealing that self-medication practices among participants of this study were not significantly influenced by level of studies ($p=0.7$).

Studies found non-significant association of socio-economic status with such antibiotics usage (Afolabi, 2008, Sapkota et al., 2010). This study did not ask about socio-economic status of participants. It is worthy to appreciate that participants of this study were educated and somehow considered to have more resources than general population and if the prevalence of self-medication with antibiotics is so high among this class, then the prevalence in the rest of the population might even be more worrisome.

Findings of this study are consistent with the findings of *Afolabi et al* and *Sapkota et al* where age was not significantly associated with antibiotic self-medication. On the other hand, in Lithuania self-medication was found to be reasonably affected by age (Afolabi, 2008, Berzanskyte et al., 2006, Sapkota et al., 2010).

One Lithuanian study showed that women were more inclined to use antibiotics as compared to men and this was further supported by a study conducted among First year medical students in Arabian Gulf University Bahrain. On the other hand, in one Nigerian study males seemed more prone to such medication than females. Interestingly, *Abay et al* did not find any such association. Findings of this study also showed that antibiotic usage is associated with gender (Abay et al., 2010, Ali et al., 2010, Berzanskyte et al., 2006, Sogunro et al., 1980).

Sapkota et al found that students in medicine and public health related disciplines were less likely to self-medicate themselves, for symptoms that do not require it, compared to other students. This suggests that studies in disciplines related to healthcare could positively contribute to reductions in self-medication practices (Sapkota et al., 2010, Sawalha, 2008b). Contrary to this, *Olayemi et al* reported self-medication with antibiotics was more prevalent among health-care and medicine related students than others (Olayemi et al., 2010). In one Iranian study, less medical students compared to non-medical ones (42.2% vs. 48%) practiced antibiotic self-medication (Sarahroodi et al., 2010). Interestingly, only 4.8% students at Gondar College of Medicine and Health Sciences in Ethiopia used antibiotics while doing self-medication (Abay et al., 2010). In this study, healthcare related professionals did more (48%) self-medication compared to non-healthcare related ones (31.3%), may be because of the reason that they were professionals and were more knowledgeable about diseases and drugs in general and infections and antibiotics in particular. This was further supported by findings of *James et*

al where fourth year medical students compared to second year had better knowledge about self-medication and had greater awareness of the risks of self-medication. So, they did self-medication more often and more appropriately (James et al., 2008).

Studies have assessed self-medication with antibiotics practices preceding surveys. One study done among participants of International Book Fair in Abu Dhabi reported that 56% of the participants used antibiotics for self-medication within the last year (Abasaeed et al., 2009). Over 53% Iranian college students and 40% Iranian university students did so during 3 months before the study (Sarahroodi et al., 2009, Sarahroodi et al., 2010). In another study, 25.9% university students in Mozambique self-medicated themselves with antibiotics during last one month where as only 20.1% participants of this study self-medicated themselves with antibiotics during 6 months before survey. However, about 32% participants of this study did antibiotic self-medication during their stay in the study countries (Lucas et al., 2007).

5.3.3 Triggers for antibiotic self-medication

It has been argued that self-medication would be acceptable and justified in real urgency of the problem and in treating minor ailments that do not require physician consultation and thus a way to cut down burden on healthcare system especially in resource-poor countries. However, certain pre-conditions should be met to guarantee user safety like the drug used must be indicated for that self-recognized condition, user must know the right use and possible side effects/interactions with other drugs. Anyhow, such emergency and minor self-medications should avoid antibiotics as this may result in adverse effects to the individuals, misdiagnosis and global emergence of multi-drug resistant pathogens (Bauchner et al., 2000, Zafar et al., 2008, Vucic et al., 2005, Verma et al., 2010).

Unrestricted sales at pharmacies, experience with similar illness, good experience with antibiotic, assumed knowledge about antibiotics, earlier use of prescribed antibiotics, wrong prescription of antibiotic, compulsive antibiotic prescribing, saving time, problem too trivial, socioeconomic factors, emergency need, access to literature, leftovers, lifestyle and a potential to manage certain illnesses through self-care were the common factors triggering antibiotic self-medication (Sawair et al., 2009, Gaash, 2008, Zafar et al., 2008, Bi et al., 2000, Haider et al., 1995, Tse et al., 1989, Olayemi et al., 2010, James et al.,

2008, Klemenc-Ketis, 2010, Abay et al., 2010). A community-based survey in Karachi reported that 51% of mothers self-medicated their children without prescriptions where as in China parental antibiotic abuse rate was reasonably lower (35.7%) (Zafar et al., 2008, Bi et al., 2000). In a Jordanian study, about 53% self-medication was initiated by community pharmacies where as *Sihavong et al* found it as high as 91% in Lao People's Democratic Republic (Sihavong et al., 2006). A study in European Union reported usage of leftover antibiotics for self-medication in up to 46% of participants (Grigoryan et al., 2007). The selection of antibiotics for self-medication was based on medical knowledge among medical (50%) and on a earlier suggestion by a doctor (32.6%) for the non-medical students in Iran (Sarahroodi et al., 2010). Students of *James et al* study perceived self-medication as way to save time, get quick relief in common problems, a learning experience, economical, and convenient as well (James et al., 2008). In another study respondents with a high self-care orientation were more inclined to do self-medication (Sawalha, 2008a). In a Malaysian study, reported reasons for self-medication were knowledge about disease and treatment (58%) and saving time (14.4%) (Ali et al., 2010). In the study of *Lau et al*, participants depended mainly on family members and previous illness experience for information on the medications they used (Lau et al., 1995). About half the participants of a study in Hong Kong (50.4%) reported that minor illness did not call for a consultation with a qualified doctor (Tse et al., 1989). Prior experience and the non-seriousness of the illness were the top two reported factors for self-medication and access to literature was the top ranked source of information (Abay et al., 2010). Keeping antibiotics is another important trigger for antibiotic self-medication. In Hong Kong one of the main sources of self-medication drugs was medicine cabinets kept at home (Lau et al., 1995, Tse et al., 1989). On the other hand, in one Malaysian study, 7.3 % female university students kept anti-infective for use in any emergency (Ali et al., 2010). In this study higher percentage (41%) of students reported keeping antibiotics with them.

Affordability of healthcare consultation and antibiotics, having own stock of antibiotics, unavailability of antibiotics without prescription and time constrains were the common reasons of antibiotic self-medication, in descending order, among participants of this study.

Strange enough, out of 89% university students in Turkey who knew that antibiotic self-medication is unhealthy, 45% still practiced it (Buke et al., 2005). Likewise, 35% were

practicing antibiotic self-medication out of 87% university students in Karachi Pakistan who knew about harmfulness of such medication (Zafar et al., 2008). Forty-two percent of our participants were also aware that antibiotic self-medication might result in adverse effects. Ironically, 63% of them reported that they would continue this practice in future. Interestingly, based on experience 19.7% of our participants thought that self-medication with antibiotic was good while to 17.4% it was safe, may be due the reason that only 6% of our participants experienced adverse effects of such medication. Indeed, such an attitude is unacceptable and indicates that even educated youth is ignorant of the magnitude of this problem and lacked complete knowledge. If the students could know exactly how detrimental antibiotic self-medication could be instead of just having perception that it is wrong; the prevalence rates would be much lower (Zafar et al., 2008).

This study reinforced finding of studies conducted in United States where a substantial proportion of Latino participants bought antibiotics without a prescription outside the United States and imported them to US (Arch et al., 2009, Mainous et al., 2008, Larson et al., 2006). A sizeable (40.8%) proportion of participants of this survey had acquired antibiotics from Pakistan for self-medication and imported them to the survey countries. This shows that acquiring antibiotics from a country where laws are lax and then importing them where they are relatively strict is common.

5.3.4 Symptoms associated with antibiotic self-medication

Self-medication with antibiotics has been practiced for a variety of symptoms. Participants of *Sarahroodi et al* study and Arabian Gulf University students in Bahrain (73.3% and 63.2% respectively) did so for respiratory problems such as sore throat, cough and common cold. Likewise, university students in Hong Kong also did so for cough, cold, fever and pain. In a Malaysian study, commonest symptoms for self-medication were related to Ear, Nose and Throat (22.5%) and respiratory tract (19.6%). It has been argued that majority of such conditions/symptoms are of viral origin and usually need no antibiotic treatment for cure. In other studies, *Afolabi et al* identified that 30.4% of those who were surveyed did antibiotic self-medication for dental symptoms. *Olayemi et al* reported gastrointestinal, urinary tract and skin infections as common conditions triggering antibiotic self-medication. Surprisingly, *Sapkota et al* found students in Nigeria doing so for even menstrual symptoms (Ali et al., 2010, Lau et al., 1995, Sapkota et al.,

2010, Olayemi et al., 2010, Afolabi et al., 2010, Sarahroodi et al., 2010, James et al., 2008, Linder and Stafford, 2001). Majority of the participants of this study did self-medication with antibiotics for respiratory (13.6%) and dental (4.2%) problems during their stay.

5.3.5 Antibiotics preferred for self-medication

Diverse antibiotics remained in use for self-medication. Studies have ranked *Penicillin* containing antibiotics as most widely used for self-medication. In a study by Sarahroodi et al, 81% of medical and 91.5% of non-medical respondents used antibiotics of this class. Among *Penicillin*, *Amoxicillin* was the most commonly used antibiotic (40.5% of medical and 74.3% of non-medical students) in both groups under study (Sarahroodi et al., 2010). Argument of frequent use of *Amoxicillin* was supported by low-cost of this drug across the globe and its wide-spread prescription by health care providers and thus might be well-known to public (Al-Azzam et al., 2007, Sarahroodi and Arzi, 2009, Sarahroodi et al., 2010).

Medical students in Iran used more diverse antibiotic types/classes (n = 8) than non-medical students (n = 4). Participants of a Nigerian study used antibiotics belonging to 12 different chemical substances including *Ampicillin*, *Tetracycline*, *Ciprofloxacin* and *Metronidazole* (Sarahroodi et al., 2010, Sapkota et al., 2010). The diversities in selection of antibiotics among different groups were might be because of their different knowledge and attitude towards such medication. Findings of this survey are consistent with earlier studies as participants consumed antibiotics for self-medication belonging to five different types/classes and among those of *Penicillin* group were on the top.

5.04 Limitations of the study

In spite of the utmost efforts to ensure validity, some limitations were recognized which are better to be acknowledged. Limitations of this study were mainly due to limitations of questionnaire.

5.4.1. Difficulties in terminologies

Defining and explaining ‘self-medication’ and ‘antibiotic’ for the participants seemed somewhat complicated. In this survey, self-medication was defined as ‘medication of one-self without professional supervision to alleviate an illness or a condition’. There is possibility that this definition was not clear to the respondents. Furthermore, this definition is different from one used by other researchers for their studies (WHO, 2000, Montastruc et al., 1997, Filho et al., 2004, Awad et al., 2005). What an antibiotic is? This was also explained in the introduction to survey. In their responses, some participants regarded non-antibiotics as antibiotics, this shows that either definition was not clear to them or they were not enough knowledgeable about micro-organisms and antibiotics.

Although questionnaire did not contain much difficult terms, irrespective of this fact, there is a theoretical possibility that participants’ encountered difficulties in understanding, interpreting and answering few or all the questions due to some medical and unfamiliar terms used; might be due their educational background and language limitations. This phenomenon might have affected the response rate or performance in some or all questions to some extent.

5.4.2. Limitations of the questionnaire

The pen and paper version of questionnaire was pilot-tested in the developing phase. However, several modifications were made to the questionnaire after comments and feedbacks and the final survey questionnaire was not pilot-tested.

In spite of five reminders, the response rate was very low. Some measures might have helped to improve the response rate even more. The questionnaire could have been shorter, although studies have shown conflicting evidence about length of the questionnaire and its influence on response rate. Some investigators found shorter questionnaire length to be effective in increasing response rate whereas others did not find any such association in response rate and length of the questionnaire (Pulakka, 2009, Asch et al., 1997, Kellerman and Herold, 2001, Edwards et al., 2002). In this survey, although the questionnaire was reasonably lengthy but it was designed in such a manner

that it would be easy to grasp and fast to fill-in with multiple-choice and one best option questions.

In addition, in self-administrated surveys under- and over-reporting because of sensitivity and taboo subject is a problem (Sapkota et al., 2010). Furthermore, self-reported nature of this survey could have led to under-reporting of the antibiotic self-medication practices. To avoid multiple responses and confirm studentship, questionnaire asked for university email identification of participant. Disclosing identity through university email address, somehow, proved a sensitive question as some of the potential respondents raised an objection in this regard.

5.4.3. Recall bias

The questionnaire in this cross-sectional study used a self-administered method to estimate the prevalence of self-medication with antibiotics in the past, especially during last six months. Therefore, by design, recall bias and thus under- and over-reporting cannot be ruled out (Sapkota et al., 2010).

5.4.4. Limitations of the Web-based survey

Some technical difficulties were encountered while using this Web-based questionnaire for survey. As there was no personal code for participants and not so many compulsory to answer questions so, there were few multiple responses and even incomplete and blank responses. Individual codes were not possible because of design of study. It would have been better to increase the number of compulsory to answer questions to better avoid missing data.

5.4.5. Limitations of sample

Another limitation of the study is that the Yahoo groups were selected by convenience, as it was practically and physically impossible to randomly select a sample of all Pakistani students in Sweden and Finland for inclusion in the study. Thus convenience census sample taken in this study is inferior to probability sampling in its representativeness to the rest of the population. However, sample size for this survey was reasonably large and

could balance out this limitation. It is still unclear whether findings of this study could be generalized to all Pakistani students in the survey countries or not.

5.05 Way forward to rationale use of antibiotics

Outcomes of innovative interventions to address antibiotic self-medication issue have not proved promising. It has been argued that contrary to beneficial effects, poorly planned interventions may prove harmful and result in increased awareness of un-prescribed availability and subsequently may raise antibiotic use. A considerable proportion of participants, in a community-based intervention to decrease antibiotic self-medication, acquired antibiotics in spite of reading or hearing something through media about rationale use of antibiotics. Thus in overcoming the influence of past behavior, role of ordinary health education seemed to be limited. *Arch et al* further supported the view that decreasing demand and supply for antibiotics should be the integral part of any comprehensive intervention strategy to address this problem (Arch et al., 2009).

Understanding sources of information and of drugs for antibiotic self-medication may help in the devising interventions to address this issue. According to *Tse et al* sources of drug information to students, in descending order of frequency, were: family members, previous illness experience, pharmacies, doctor or nurse, television or radio, newspapers or magazines, friends and teachers. Keeping this diversity of sources in mind, *Sapkota et al* were of the view that interventions are required at a number of levels to address this problem: public health education directed and designed for populations and medical education targeting health professionals. In most health related problems, most likely sources of information are family, friends and colleagues and not the formal education sources. Thus providing health education on the appropriate use of antibiotics to population at large may prove more beneficial. The healthcare professionals and related authorities should be involved in health education. Adequate drug information and counseling should be provided to patients thus promoting a good self-care program in hours of need. Good prescribing and pharmacy practices should also be promoted, as clinicians and pharmacists are likely to prescribe antimicrobial for symptoms that do not require antibiotics (Sapkota et al., 2010, Umeora et al., 2008, Adinma et al 2008, Tse et al., 1989, Lau et al., 1995).

Grigoryan et al were of the opinion that adoption of good prescribing practices could avoid leftovers from prescribed courses and thus self-medication with antibiotics. To meet this, dispensing of the exact numbers of doses and patient education must be promoted. Moreover, all sources of antibiotics for self-medication should be prevented. It is high time to address the future threat of un-prescribed antibiotic purchases through internet, a factor that may further worsen antibiotic self-medication (Grigoryan et al., 2007).

Concepts of ‘community pharmacies’, ‘antibiotic pharmacists’ and ‘collaborative care’ were also introduced to address antibiotic self-medication and inappropriate prescribing issues. *Awad et al* was of the view that implementation of pharmaceutical care through community pharmacies could help alleviate this issue. Community pharmacists were further thought to play an active role in the provision of primary health care by treating minor ailments and referring patients to physicians where ever required. Studies have supported role of antibiotic pharmacists in enhancing patient care. Idea of collaborative care was floated as continuing treatment of patients through pharmacists under supervision of physicians. All these innovations requires improvements in clinical knowledge and skills of pharmacists, their willingness to take the responsibility of patient’s medication and close working relationship with other stakeholders in healthcare. However, this might be even more difficult to implement in countries like Pakistan where only 22% pharmacies have qualified personnel and only 19.3% meet the licensing requirements (Butt et al., 2005, WHO, 1998, Awad et al., 2005, Weller and Jamieson, 2004, Bradley and Blenkinsopp, 1996)

There is conflicting evidence that imparting information on antibiotics to public is good. However, some researchers seemed to have consensus over its essentiality with an argument that people should know potential harmful effects that could result if antibiotics are used without a prescription. This in turn is expected to encourage the proper use of such drugs and help diminish the magnitude of non-prescribed antibiotic use. It has also been suggested that health education programs should be incorporated in teaching institutions to address potential problems of self-medication with antibiotics. However, correlation between knowledge and behavior is controversial (Buke et al., 2005, Carey and Cryan, 2003, Sarahroodi et al., 2010).

The Self-medication with Antibiotics and Resistance (SAR) Consortium has recommended that interventions aiming at preventing self-medication should address both public education and enforcement of regulations regarding sale of antibiotics simultaneously. In addition, to observe a significant change in user-behavior the intervention/s should be implemented for longer periods. Results of intervention study by *Gastelurrutia et al* in Spain re-enforced such recommendations by their moderate success in preventing antibiotic self-medication that was achieved through public education and pharmacy oversight interventions implemented simultaneously and for about five years (Gastelurrutia et al., 2006, Grigoryan et al., 2008, Arch et al., 2009).

Although self-medication is a usual practice and at times inevitable, drug authorities and healthcare professionals should take an active role in educating the public about the pros and cons of any such medication (Abay et al., 2010).

In short, modifications in consumer behavior through education, adequate and easy access to health care services including clinical and laboratory services and proper enforcement of regulations is mandatory, from public health standpoint, to address this issue.

5.06 Public health implications

Like rest of the developing world, self-medication with antibiotics among Pakistanis is an issue of public health concern. Reduction in self-medication through rational use of antibiotics is among major public health challenges. This particular study has assessed antibiotic self-medication practices among Pakistani students in Sweden and Finland. This study has also offered recommendations to plan strategies to address this issue. Better knowledge and understanding about antibiotics and harms of self-medication may help in improving practices.

In Pakistan, threats of antibiotic self-medication and associated health risks are not well-recognized at public level due to illiteracy, general lack of information, poor recognition at state level and relatively free availability of antimicrobial due to flaws in legislation. Many wrong practices, affordability for health care consultation, free accessibility and family practices are thus hindering rationale use of antibiotics. There is need to address

this issue by improving awareness among public and healthcare providers through education, enforcement and implementation of laws.

A holistic public and international health strategy; better awareness about implications of self-medication, preventing carriage of antibiotics abroad without a prescription and strategies to make healthcare easily accessible and cost-effective for students studying abroad, is recommended.

Further discussions on antibiotic self-medication among students abroad should be continued. Relationship of emerging microbial resistance and self-medication is under debate. However, from public health standpoint, self-medication with antibiotics should be avoided. Rationale use though may not help in preventing development of resistance to antibiotics but may help in improving health of users themselves.

5.07 Future research implications

This study has also opened gateways for future research on the subject; besides showing that self-medication with antibiotics among Pakistani students, studying abroad is a real addressable issue.

This study focused antibiotic self-medication practices among Pakistani students who came to Sweden and Finland and were members of selected Yahoo groups. To better validate the results, it is advisable to expand future research to include Pakistani students who are in these countries and not members of Yahoo groups. Additional studies are essential to find whether the antibiotic self-medication practices described here are also prevalent among Pakistani students in other countries abroad. Further studies are necessary to evaluate the impacts of such self-medication on health of students. Future comparative studies could also be planned to compare practices of Pakistani students while in Pakistan and abroad. It would be interesting to include students of other nationalities to know their practices while abroad and to make comparisons based on nationalities. This may help in understanding differences in epidemiology of self-medication with antibiotics among students from different countries, in different countries and of different nationalities.

This study targeted a population with more resources than the general population. Future research should be expanded to include other populations of Pakistan to determine the overall prevalence of self-medication with antibiotics. Future studies should also touch knowledge deficits and attitudinal barriers in elimination of antimicrobial self-medication. Such information could then be of use to develop interventions directed at restricting antibiotic self-medication.

Future objective studies on this issue, though difficult to conduct, do need to be carried out both among Pakistani students at different level of studies in different countries and general population in Pakistan. It would also be interesting to investigate the pre- and post-arrival practices of students regarding self-medication with antibiotics and other drugs as well. This may help in understanding the influence of past practices on current self-medication practices. Additionally, this study did not explore self-medication with other drugs and future studies should address this aspect of self-medication among students abroad. Future research may also focus influence of family and peer practices on self-medication.

Role of antibiotic self-medication in the development of antibiotic resistance is difficult to estimate. Moreover, we know very little how and in which way antibiotic self-medication contributes towards resistance. However, antibiotics resistance developing over time with indiscriminate use is a serious issue, thought to be associated with antibiotic self-medication. It would also be informative to know the relationship between self-medication and antibiotic resistance in Pakistan through future studies.

6. CONCLUSIONS AND RECOMMENDATIONS

In summation, the findings of this survey provide the first data to throw light on the phenomenon of self-medication with antibiotics among Pakistani students studying abroad in two European countries i.e. Sweden and Finland. This type of practice could be speculated among other Pakistani students abroad.

The proportion of students who used antibiotics for self-medication without medical supervision is reasonably high. One out of three participants of this study did so while they were in survey countries. Results show that country of study, insurance status, poor health, level of studies, gender, area in home country and duration of stay in the survey countries did not have any association with antibiotic self-medication. However, sickness during six months before survey, professional background and work status seemed to have an association with antibiotic self-medication practices. Knowledge about harmfulness of antibiotic self-medication did not substantially seem to contribute towards avoiding such behavior.

Unwillingness to take part and non-response were drawbacks of the study. Web-based anonymous questionnaire survey did not allow exploration of non-participants and non-responders. Due to self-reported nature of survey, it is also difficult to estimate under- and over-reporting of self-medication.

However, this data on self-medication with antibiotic practices among Pakistani students studying in Sweden and Finland has advantage of convenience census sample. For better elaboration of phenomenon other Pakistani students including non-responders and unwilling to participate need to be explored to better validate the results.

This study has also opened horizons for further research on this subject, besides showing that it is a real problem and should be addressed. Keeping in view the scope and limitations of the study, further research may be extended to Pakistani students in other countries abroad and may include self-medication with other drugs. It would also be interesting to include other international students in such surveys to know their comparative practices. This study only touches upon and briefly explores antibiotic self-

medication issue, the relation between self-medication and antibiotic resistance could be a useful subject for future studies.

Self-medication with antibiotics, despite knowing that it is incorrect, is reasonably high among Pakistanis studying in Sweden and Finland. A comprehensive public health strategy; awareness regarding the implications of self-medication with antibiotics through health education, strategies to prevent the supply of medicines without prescription, preventing carriage of antibiotics abroad without a prescription and strategies to make healthcare easily accessible and cost-effective for students studying abroad, is recommended. Improved knowledge and understanding about self-medication and antibiotics may result in rationale use antibiotics and thus limit emerging microbial resistance issues.

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Appendix – I

Online Survey Questionnaire

Self-medication with antibiotics among Pakistani students in Sweden and Finland

A web-based cross-sectional comparative survey 2009

Information for the Participants

Dear Participant,

This survey is about use of antibiotics among Pakistani students in Sweden and Finland. You have been selected as part of Pakistani students on Yahoo groups operating for Pakistani students in Sweden and Finland. The information provided by you may serve as tool to understand the said phenomenon among Pakistani students. This may further help in devising strategies to address this issue and thus promoting rationale use of antibiotics.

Participation in this questionnaire survey is ABSOLUTELY VOLUNTARY. The questionnaire is anonymous, no participant will be recognized after the survey and the data will be used for study purpose only. BUT you have to write your university (Finland/Sweden) email address before answering the questionnaire. This is to confirm that you are student and also to avoid multiple responses from one participant. If you are member of more than one yahoo groups then just reply once to this questionnaire.

Please read answering instructions carefully. Read each question carefully and answer them sincerely. Answer each question based on your own knowledge and practice.

Your participation in this survey will be highly appreciated.

Thanks for your participation.

Definitions:

Self-Medication: Medication of oneself without professional supervision so as to alleviate an illness or a condition

Antibiotic: Antibiotics are powerful medicines that fight bacterial infections OR antibiotic is a substance or compound that kills, or inhibits the growth of, bacteria

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* Required

Background Information of the participants

1. Your valid university / work (official) email address in Sweden/Finland *

2. Your age in years

3. Your gender

- Male
 Female

4. To which administrative area of Pakistan you belong?

- Punjab
 Sindh
 NWFP
 Balochistan
 Gilgit Baltistan
 Federal Capital Islamabad
 FATA

5. Where are you living at the moment?

- Pakistan
 Sweden
 Finland
 Other:

6. In which year did you come (for the first time) to Sweden/Finland for studies?

- Before 2005
 2005

- 2006
- 2007
- 2008
- 2009

7. In total how many months have you stayed in Sweden/Finland since your first arrival?

8. Have you visited back home in Pakistan after your first arrival in Sweden/Finland?

- No
- 1-3 times
- More than 3 times

9. In which degree level are you currently enrolled in Sweden/Finland?

- Never studied in Sweden/Finland
- First cycle (Bachelor)
- Second cycle (Master)
- Third cycle (Doctoral)
- Studies completed
- Other:

10. Where are you registered as student / completed your studies?

- In Sweden
- In Finland
- Both
- Other:

11. What is your professional background?

- Medical, pharmacy, nursing or other health care professional
- Non-health related professional

12. Are you working in Sweden / Finland at present?

- Only studying, not working at all
- Part-time working with university studies
- Full-time working with university studies
- Full-time working only

- Not working or studying

13. What is your self-perceived state of general health at present?

- Excellent
 Good
 Average
 Bad

14. Are you insured (have health insurance) while you are here in Sweden/Finland?

- No I am not insured
 Yes I have Swedish state national health insurance
 Yes I have Finnish state national health insurance
 Yes I have private health insurance
 Yes insured by my employer
 Other:

Use of Antibiotics**15. Did you ever use antibiotics for any illness in your life?**

- Yes
 No

16. If you answered yes to question no. 15, was that antibiotic use

- Prescribed by qualified person
 Un-prescribed (self-medication)
 Both

17. Did you ever use antibiotics through self-medication to treat any illness?

If you answer NO to question 17 then go directly to question 28.

- Yes
 No
 Not sure

18. If you did self-medication with antibiotics, how often did you do that?

- Always when you got sick
- Most of the time when you got sick
- Some times when you got sick
- Rarely when you got sick

19. How much are you satisfied with your experience of self-medication with antibiotics so far?

- Completely satisfied
- Partially satisfied
- Neither satisfied nor unsatisfied (I do not know)
- Partially unsatisfied
- Completely unsatisfied
- I have no experience of self-medication with antibiotics

20. From where did you get antibiotics for self-medication most often?

(You can select more than one option for this question)

- I do not do self-medication with antibiotics
- Pharmacy/Medical store without prescription or with old prescription
- General store
- Family
- Friend
- Colleague
- Left over of previously prescribed/un-prescribed antibiotic
- Other:

21. If you did self-medication with antibiotics, did you ever encounter any adverse / side effect of such medication?

- Yes
- No
- Not sure

22. If you answered yes to question 21, then write some side-effects you encountered?

23. For self-medication with antibiotics, how do you decide that you need antibiotic for your illness?

- Always on your own
- Mostly on your own

- Some times on your own
- Rarely on your own
- Never on your own

24. Based on your practice, do you think self-medication with antibiotics is good?

- Yes
- No
- Not sure

25. Based on your experience, do you think self-medication with antibiotics is safe?

- Yes
- No
- Not sure

26. Do you know if self-medication with antibiotics may result in adverse / side effects?

- Yes
- No
- Not sure

27. Will you continue using antibiotics for self-medication in future?

- Yes
- No
- Not sure

Self-medication with antibiotics in Sweden/Finland**28. Did you use antibiotics through self-medication to treat any illness while in Sweden/Finland?**

If you have answered NO to question 28 & 29 then skip rest of the questions.

- Yes
- No
- Not sure

29. Do you have your own antibiotics for self-medication here in Sweden/Finland?

If you have answered NO to question 28 & 29 then skip rest of the questions.

- Yes
 No

30. Which antibiotics you have used for self-medication here in Sweden/Finland so far?

- None
 Oral (Taken by mouth)
 Inject able (Taken as injection)
 Local (Used externally like for skin disease)
 All (Oral, Inject able, Local)

31. While in Sweden / Finland, for which symptoms / disease condition did you use antibiotic?

32. Can you name some antibiotics which you have with you in Sweden/Finland for self-medication?

33. Can you name one antibiotic which you mostly used in Sweden/Finland for self-medication? If any

34. From where did you get/purchase antibiotics for self-medication in Sweden/Finland?

- Only from Pakistan
 Only from Sweden
 Only from Finland
 From Pakistan, Sweden and/or Finland
 Other:

35. During last 6 months, did you get ill in Sweden/Finland?

- Yes
 No

36. During last 6 months, how many times have you used antibiotics for self-medication while in Sweden/Finland?

- Not at all

- 1-3 times
- More than 3 times

37. While in Sweden/Finland what is the reason to prefer self-medication with antibiotics?

(You can select more than one option for this question)

- You have your own stock of antibiotics so you can decide yourself which antibiotic you need
- Can not afford visit to a doctor to get prescription and antibiotics are expensive
- Do not wish to visit a doctor to get a prescription
- Antibiotics could not be purchased without prescription
- Time constrains
- Other:

38. What is your motivation for antibiotics you use for self-medication?

(You can select more than one option for this question)

- Previously prescribed by qualified doctor
- Previously given by pharmacist/medical store personnel without prescription
- You have your own motivation as you like this/these antibiotic/s
- Previously given/told by friend/family during any illness
- Other:

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