RESEARCH ARTICLE

A MULTI-INTERVENTION PROGRAM TO REDUCE ANTIBIOTIC PRESCRIPTION FOR PATIENTS WITH UPPER RESPIRATORY TRACT INFECTION IN PRIMARY HEALTH CARE SETTINGS IN THE UNITED ARAB EMIRATES

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Abstract

Overuse of antibiotics in treating Upper Respiratory Tract Infections (URTIs) in Primary Health Care Clinics (PHCCs) is an area of great concern due to development of antimicrobial resistant pathogens and unnecessary expenses to health care systems and patients.

The present study is the first controlled study of its kind conducted in local PHCCs in Dubai and Sharjah, UAE (over a 3 month period from December 2006 to February 2007). Using two study samples (no intervention/control group and intervention/study group), this study measured the impact of a multi-intervention consisting of physician management guidelines and patient educational leaflets to reduce antibiotic prescriptions to patients with URTIs and sore throat. Differences in socio-demographic characteristics, signs and symptoms, and home self-management between the two study populations were considered. Furthermore, the impact of age and education on the effectiveness of the multi-intervention program was also investigated.

A significant reduction in antibiotic prescriptions from 64% (no intervention group) to 21% (intervention group) resulted. Evidence was provided to support the argument that this significant reduction in antibiotic prescription was not influenced by important confounding factors like throat yellowish discharge and ear pain.

The significant reduction in antibiotic prescriptions clearly indicates that use of physician management guidelines and patient educational information reduces patient demand for antibiotic prescription. Furthermore, since the reduction in antibiotic prescription was not influenced by age or education, we contend that the successful multi-intervention program used in this study could be successfully implemented to a wider population.

Introduction

The extent of overuse of antibiotics in treating Upper Respiratory Tract Infections (URTIs) in Primary Health Care Clinics (PHCCs) is an area of great concern. This concern arises from the development of antimicrobial resistant pathogens and an unnecessary increase of expenses to health care systems and to patients[1].

Primary health care practitioners frequently prescribe antibiotics to treat URTI symptoms, even though there is no proof of benefit of this therapy[2, 3]. In addition, patients with URTIs expect to receive an antibiotic prescription from the physician after diagnosis[4, 5, 6]. Antibiotic expectation of patients/patient demand therefore, plays an important role in over-prescribing antibiotics for respiratory infections[7]. It has been demonstrated that when general practitioners (GPs) prescribe less antibiotics for respiratory tract infection, their patients subsequently consult less frequently, which leads to a process of demedicalization[8].

In an exploratory study conducted by our group in eight PHCCs in the UAE, we recorded that 59% of patients with URTIs were prescribed antibiotics (unpublished data). Furthermore, URTIs were found to be the most common reason for patients to visit a primary health care center for treatment. This has also been shown elsewhere, such as the United States, Canada, Turkey, Taiwan and Spain where URTIs account for most antibiotic prescriptions[9].

The situation in primary health care centers is rather challenging. Fischer et al indicated that due to shortage of time as well as over-crowded PHCCs, physicians' efforts to reduce/delay antibiotic prescription through communication with patients and recommending self-medication with home remedies were rare[10]. Furthermore, patients and physicians have different perceptions of the nature of infection and their expectations

are usually not communicated[11]. Patients have a growing role in therapeutic decision-making, therefore patient education and improving communication between physicians and patients can positively influence the appropriate antimicrobial use[12, 13].

Independent evidence suggests that physician management guidelines could lead to appropriate antimicrobial prescribing and use[1, 14] and that educational intervention of the public is essential in altering patient demand and pressure on general practitioners for inappropriate antibiotic prescribing[15, 16]. This in turn can control the over-prescribing of antibiotics[12, 17]. It has also been reported that written information in addition to verbal instruction to patients would result in better outcomes in using antibiotics[7, 18].

However, educational interventions aimed at either the physician or patient could not probably bring a successful result in reducing antibiotic use. The intervention should be multidimensional. A number of controlled studies prove that antibiotic prescription rates could be reduced successfully if combinations of interventions are used. These interventions should focus on patients' expectations as well physicians' prescribing behaviours[19, 20, 21, 22, 23].

Initial unpublished data collected by our group from eight PHCCs in the UAE revealed that the symptom of sore throat was present in most of the URTIs cases that were referred to those clinics in Dubai and Sharjah (76%) and it was higher than other presenting signs and symptoms (fever 45%, headache 62%, yellowish throat discharge 39%, cough 72%, ear pain 31%, runny nose 54% and nasal yellowish discharge 22%).

Having large numbers of URTI patients with symptoms of sore throat attending PHCCs, the aim of this study therefore was to examine the impact of implementing a multiple intervention program including physicians' management guidelines (through verbal discussion) and patients' educational leaflet plus verbal instruction, on reducing antibiotic prescription for URTIs with sore throat. Again from the eight clinics that were initially evaluated, high prescribing of antibiotics was more noticeable in two clinics (Hor Alanz Clinic, Dubai 63% and Reqah Clinic, Sharjah 71%). Therefore, these two clinics were chosen to be included in this research program to investigate the impact of a multi intervention program on reducing antibiotic prescription.

In summary the present study is the first controlled study of its kind conducted in local primary health care centers in Dubai and Sharjah, UAE. Using two study populations (no intervention and intervention groups) this study aimed at measuring the impact of combined interventions, of introducing management guidelines to physicians as well as educational leaflets to patients, on reducing antibiotic prescriptions to patients with URTIs and sore throat. Confounding factors such as differences in socio-demographic characteristics, signs and symptoms, and home self-management between the two study samples were considered in the data analysis. Furthermore, the effect of age and education on the impact of the multi-intervention program was also investigated.

Methods

The current controlled study comparing no intervention vs multi-dimensional intervention to reduce antibiotic prescribing at PHCCs, was approved by the Undersecretary of Curative Medicine in the Ministry of Health (MOH) and the Medical Directors of Dubai and Sharjah districts. Ethical permission to carry out the research study was obtained from the respective Research Ethics Committees. A circular from the Undersecretary requesting participation in the research study was sent to two clinics, Hor Alanz Clinic in Dubai and Reqah Clinic in Sharjah. In the initial exploratory study conducted by the investigators, these clinics were estimated to be the busiest clinics in each Emirate. We documented that URTIs accounted for about 50% of the visits made by patients to these two clinics and that antibiotic prescription rates for adult patients with URTIs were estimated to be 63% and 71% respectively. Data collection was conducted in the two clinics over the three months of December (2006), January and February (2007) (6 weeks for phase I and 6 weeks for phase II). These three months are considered to be the high season of flu and URTIs in the UAE.

The protocol for the no-intervention arm of the study required the investigator to be based in the pharmacy of each clinic. Data was collected from a cross-sectional sample comprised of local UAE men and women of adult age with upper respiratory tract infection, attending the two PHCCs (Hor Alanz and Reqah clinics) and agreeing to participate in the study. Patients were recruited by approaching those who were suffering from upper respiratory tract infection. All 166 patients approached agreed to participate and were included in the no-intervention arm of the study (Group I).

The inclusion criteria were male or female UAE nationals suffering from URTI and sore throat aged between 14 – 60 years while the exclusion criteria included patients less than 14 years of

age, staff working in the MOH, patients unwilling to participate and patients with asthma or allergic rhinitis. All patients were asked for their consent to participate in the study and were notified that all collected data is confidential.

A patient interview questionnaire was developed for data collection. The questionnaire was constructed in English (Appendix I) and after following a process for ensuring translation validity and checking for face validity, it was produced in Arabic. The Arabic questionnaire was then given to others for translation back into English. The original English questionnaire was then compared with the new English version to check for accuracy. Necessary modifications were then undertaken in the Arabic version of questionnaire. Furthermore, to check the face validity of the questionnaire, it was given to three health care professionals (2 pharmacists and one epidemiologist). Their ideas about clarity, appropriateness and whether it measured what it was supposed to measure were recorded. Changes requested by any individual were discussed with the group and if appropriate the changes were made. The patient interviews were conducted in Arabic, face-to-face by the investigator. Patients were interviewed while their prescriptions were being prepared. The health card number of patients included was taken as reference to trace the prescription as names were not indicated on the questionnaire.

The second component of this study involved the multi-intervention arm that was conducted subsequent to the no-intervention arm. The researcher was based in the nursing room with access to all patients. In this study, the multi-intervention approach included physician management guidelines (Appendix II) which were extracted from SIGN (Scottish Intercollegiate Guidelines Network) for sore throat as well as an educational leaflet for patients with URTI and sore throat (Appendix III).

Following the approval by the respective director of each PHCC, a set of management guidelines was given to each general practitioner and verbal explanation of the benefit of implementing the guidelines in their setting was explained. The researcher explained to physicians the reason for the intervention program and the aim, which was to reduce over prescription of antibiotics for patients with URTI and sore throat. Along with the management guidelines a set of journal articles on the necessity of antibiotic prescription reduction in URTIs, was distributed. The management guidelines were accompanied by an explanation of why and where the guidelines were produced. Physicians were then asked to read the management guidelines and those that agreed to participate in the study were asked to indicate their commitment to follow the guidelines and to write down any suggestions or remarks. The guidelines were given to 10 general practitioners in the two clinics (5 in each clinic) and all agreed to participate. It was emphasized that the guidelines were only a referral source rather than a substitute to their clinical judgment.

Patients were given an educational leaflet (Appendix III) and were informed of the risk of excessive/unnecessary use of antibiotics and the fact that URTIs are caused mostly by viruses and antibiotics will have no beneficiary effect. The length of explanation depended on whether the patient could read or not. Patients who were illiterate were provided with detailed explanation of everything that was written in the leaflet. Furthermore, verbal instructions and information were given to ensure that patients received the educational intervention properly even if they did not read the leaflet. The educational leaflets plus verbal instructions were aimed at modifying patients' demand for antibiotic prescriptions. Prior to their visit to the general practitioner, patients were also asked a set of questions (the same questionnaire used for the no-intervention arm). The purpose of the questionnaire was to gather information to reflect the socio-demographic characteristics of patients with sore throat, their consumption of medication, home remedies and traditional medicine prior to their attendance of primary health care clinics and the extent of the signs and symptoms of sore throat suffered by those patients. Data collection was carried out from 215 patients from both clinics. The inclusion and exclusion criteria and patient consent were the same as for the no-intervention group.

The sample for the intervention arm of this study comprised of 215 patients: National UAE men and women (110 from Hor Alanz Clinic, Dubai and 105 from Reqah Clinic, Sharjah) attending PHCCs with URTIs including sore throat (Group II) who agreed to participate in the study. Patients were recruited by approaching those who had URTIs plus sore throat. Upon agreement to participate, patients were given educational leaflets and verbal explanation on the etiology of URTI and why receiving antibiotics would not benefit them if their symptoms were diagnosed as viral infection.

Finally, statistical analyses were performed using the SPSS statistical package. The data is expressed as % together with 95% CI and analysed using a one way ANOVA with priori contrast between no intervention and intervention groups.

Results

The socio-demographic characteristics of Group I (no intervention) and Group II (intervention) were compared (Table 1). The data shows no significant differences among the two study populations in any of the socio-demographic characteristics listed.

The Primary Outcome Measure for this study (antibiotic prescription) was compared between the two study groups. The data in Table 2 shows that antibiotic prescription for patients in Group II (intervention) was 21% and was significantly less (p=0.000) when compared to 64% for patients in Group I (no intervention).

Possible confounding factors on antibiotic prescription such as use of medication, home remedies and traditional medicine prior to their visit to PHCCs were taken into account. Table 3 displays a comparison of the use of medication, home remedies and traditional medicine by the two samples prior to their visit to primary health clinics. Group I consumed significantly more medication prior to visiting the PHCC (67%) than Group II (55%), (P=0.003). However, the results show no significant difference between the two groups in using home remedies (P=0.221) and traditional medications (P=0.212).

The possibility that signs and symptoms associated with URTIs could have been different between the two samples and that this difference might have impacted on the primary outcome measure was also investigated. Table 4 displays specific signs associated with URTIs in the two samples. There is no significant difference among the two samples in signs such as fever (P=0.141), cough (P=0.297), productive cough (P=0.169), runny nose (P=0.245) and nasal yellowish discharge (P=0.325). However the results show that the Group I population has a significantly greater number of patients with yellowish throat discharge (P=0.000).

In addition, Table 5 displays specific symptoms associated with URTI in the two samples. There is no significant difference among the two groups in symptoms such as headache (P=0.067). However the results show that there is a significant difference among the two groups in having ear pain (P=0.044), with Group I, the no intervention group, having greater numbers of patients with ear pain.
Based on the data shown in Tables 4 and 5, further analysis was undertaken to specifically examine the impact of significant confounding factors between the two groups on the primary outcome measure (antibiotic prescription). Table 6 presents the impact of the intervention program on the primary outcome measure (antibiotic prescription) for significant confounding factors such as throat yellowish discharge and ear pain among the two study groups. The results show a significant difference between antibiotic prescriptions for patients with symptoms of throat yellow discharge (P=0.000) and ear pain (P=0.000). Antibiotic prescriptions were significantly reduced following the implementation of interventions.

Lastly, the impact of age and education on the effectiveness of the intervention on reducing antibiotic prescription in the two groups was also examined. In Table 7, each study population was divided into two subgroups according to age (younger group: age 14-24 years and mature/ older group: age 25-60 years). Group II (intervention) showed a significant reduction in antibiotic prescription regardless of age. Similarly, in Table 8, each group was divided into two subgroups according to education (no/ low education (illiterate and primary) and higher education (secondary, high school and university/post grad). Again Group II (intervention) showed a significant reduction in antibiotic prescription regardless of level of education.

Discussion

Although medication can treat diseases they also have the potential to cause harm. Antibiotics are a good example of this situation. Over-prescribing of antibiotics in health care settings has brought along the worldwide problem of resistant pathogens[14, 17, 24, 25, 26] that the pharmaceutical industry is struggling to overcome by producing newer antibiotics.

The existent recommendation that antibiotics are only indicated in bacterial infection is frequently not complied with. Physicians diagnose URTIs upon clinical findings but often disregard the fact that URTIs could be of viral origin and antibiotic treatment is not indicated[27]. It has been previously documented that clinicians prescribe antibiotics not only to relieve symptoms, but also to prevent disease transmission, prevent secondary infections and to satisfy patients' demand for antibiotics[28, 29]. URTIs are one of the most common reasons for patients' visits to PHCCs in the UAE as shown by our initial exploratory data collected from eight primary health care clinics in the UAE. We documented that more than 76% of patients with URTI attending primary health care in the UAE had sore throats. Antibiotics were prescribed for more than 57% of these patients. Our initial exploratory study also showed that patients' demand had a great influence over physicians' behaviour in prescribing antibiotics. Physicians had little or no communication with patients, and providing patients with

what they demand shortens the visitation time and pleases patients. Indeed, it is well documented that prescribing decisions are greatly influenced by patients' demands for antibiotics[30, 31, 32] and patients' demand has a greater influence over physicians' decision in prescribing antibiotics when physicians are uncertain for the need for antibiotics for that particular patient.

Many studies suggest that effective interventions should influence the behaviour of clinicians and patients toward antibiotic prescribing via developing protocols that focus on appropriate diagnosis of respiratory tract infections and effective education programs for patients. Indeed, using a multidisciplinary intervention can result in behavioural changes of patients and physicians and significantly reduce antibiotic prescription for sore throat without affecting the outcome[33].

The current two-stage controlled study was conducted in two clinics Hor Al anz Clinic, Dubai and Reqah Clinic, Sharjah where high prescribing of antibiotics had been previously recorded (63% & 71% respectively). The first stage involved collecting data from a control (no intervention group) and the second stage involved the implementation of a multi-intervention program aimed at reducing antibiotic prescription for patients with URTIs with sore throat. It was previously reported that over-prescription of antibiotics often results from a deficiency of knowledge of physicians[1, 14]. Therefore providing physicians with diagnostic and management guidelines can help them in their decision-making. In this study, the major impetus of the guideline provided to physicians was to encourage appropriate diagnosis and treatment of sore throat so that the overuse of antibiotics is avoided. It was emphasized that the guidelines were to guide decision-making rather than as a substitute to clinical judgment.
All the clinicians in this study were aware of the evidence for the limited effect of antibiotic treatment in URTI (sore throat) and agreed that antibiotic over-prescribing for URTI did exist in most of primary health care settings in UAE. All general practitioners in the selected clinics welcomed implementation of management guidelines and educational intervention.

It is also documented that patient educational interventions, such as a patients' educational leaflet given at the time of consultation, are essential in altering patient demand and pressure on general practitioners for prescribing antibiotics inappropriately[15, 34].

Based on the above and after the introduction of management guidelines for physicians, educational leaflets were given to patients who attended the clinic with URTI and sore throat. Verbal explanations were given to each patient prior to his or her visit to the physician. It was explained to patients why antibiotics are not needed in most of the URTIs and that over-use of antibiotics can result in developing resistant pathogens. They were encouraged not to pressurize physicians to prescribe antibiotics if the physicians did not think antibiotics were necessary. .
The primary outcome measure was the % of antibiotic prescription to patients visiting PHCCs with URTIs and sore throat. The data in Table 2 clearly shows that the multi-intervention approach implemented was successful in significantly reducing antibiotic prescription. Antibiotic prescription was reduced from 64% for patients in Group I (no intervention) to 21% for patients in Group II (intervention). It appears that the educational intervention resulted in reducing patient demand for antibiotic prescription and similarly the management guidelines resulted in improving the physician diagnostic approach in distinguishing between viral and bacterial infections and better decision-making regarding antibiotic prescription. Confounding factors that could have impacted on the primary outcome measure were also investigated. One confounding factor examined was the use of self-medication, home remedies or traditional medicine prior to visiting the PHCCs. The two study groups were compared and the data presented in Table 3. That the no intervention group have used significantly more medications prior to visiting the clinic could be a possible confounding factor that might have partially impacted on the difference in the primary outcome measure between the two groups. It would be logical to assume that those patients who had tried other medications without relief would be requesting antibiotics and/or would be more in need of antibiotics and this could have contributed to increased antibiotic prescription for Group I. Since Group II had less previous medication, one might also argue that the effectiveness of the intervention in reducing antibiotic prescriptions cannot be attributed to prior intake of medication which could have reduced the severity of symptoms.

The two study groups (no intervention and intervention) were also compared based on the signs and symptoms they had to identify and whether differences in signs and symptoms between the two groups could be a reason for reduced antibiotic prescription in Group II. Analysis of signs, presented by the two samples (Table 4), showed a significant difference for throat yellowish discharge (P=0.000) between the two groups. Percentage of patients with throat yellowish discharge was higher (71%) in Group I (no intervention) compared to Group II (intervention) (48%). Furthermore, analysis of the symptoms presented

by the two samples (Table 5), showed a significant difference among patients in the two groups with regard to ear pain (P=0.044). The percentage of patients with ear pain was higher (37%) in Group I (no intervention) compared to Group II (intervention) (26%).

The significant difference observed in signs and symptoms between the two groups with Group I demonstrating a significantly higher % of patients with throat yellowish discharge and ear pain raised the question as to whether or not these differences could have impacted on the primary outcome measure, i.e. antibiotic prescription. It is logical to assume that those patients with throat yellowish discharge and ear pain required antibiotics and hence antibiotic prescription was higher for Group I.

This possibility prompted us to undertake further analysis to determine the difference in antibiotic prescription for those patients with those particular signs and symptoms in the two study groups. In this analysis, we separated the patients with throat yellowish discharge and those with ear pain to determine the impact of these confounding factors on the primary outcome measure. The data in Table 6 shows that 71% of Group I patients who had throat yellowish discharge received antibiotics compared to 35% of Group II patients who had the same sign. In addition, the data in Table 6 shows that 72% of Group I patients who had ear pain received antibiotics compared to 25% of Group II patients who had the same symptom.

There was a greater than 50% reduction in antibiotic prescription with the interventions implemented and this indicates successful influences antibiotic prescription for patients with throat yellowish discharge and ear pain. Furthermore, the results nullify the suggestion/perception that the lower total number of patients suffering from throat yellowish discharge and ear pain among Group II could have resulted in the reduced antibiotic prescription rather than the interventions per se.

The authors acknowledge that the current study has some design limitations due to the multi-intervention approach implemented. For example, it is difficult to deduce whether the management guidelines intervention for physicians or the patient educational leaflets intervention had a greater influence on the reduction of antibiotic prescription.

In an attempt to deduce this information and based on the assumption that older patients are more likely to request antibiotics from physicians than the younger patients, Group I (no intervention) and Group II (intervention) were divided into 2 subgroups by age (young group = 14-24 years and mature/old group = 25-60 years) (Table 7). For the young group, it would be assumed that the physicians' decision prevailed (less pressure from patients), hence the reduction in antibiotic prescription could reflect the effectiveness of the management guidelines in modifying physician prescribing behaviour. For the mature/older group it would be assumed that the physician's decision is influenced by patients' demand for antibiotic prescription. However one might argue also that this old group actually needed more antibiotic prescriptions, since this group of patients are less tolerant of symptoms of URTIs. Indeed, studies have shown that older patients require more medication and are therefore more likely to receive more medication[35].

The other question that we raised was whether the level of education of patients could have influenced the effectiveness of the interventions. The patients were divided into two subgroups by education (low level education = illiterate and primary education, higher level education = secondary/high school and university/post graduate) (Table 8). The data shown in Tables 7 and 8 clearly indicate that the interventions successfully and significantly reduced antibiotic prescription regardless of age or education.

In conclusion, the multi-intervention program for reducing antibiotic prescription in UAE PHCCs resulted in a significant reduction in antibiotic prescriptions from 64% (no intervention group) to 21% (intervention group). This significant reduction in antibiotic prescriptions clearly indicates the effectiveness of physicians in following management guidelines and the effectiveness of the educational information given to patients. Evidence was provided to support the argument that this significant reduction in antibiotic prescription was not influenced by important confounding factors like throat yellowish discharge and ear pain. Furthermore, since the reduction in antibiotic prescription was not influenced by age or education, we contend that the successful multi-intervention program used in this study could be successfully implemented to a wider population with great anticipation of successful implementation.

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Table (1): The Socio-Demographic Characteristics of patients with sore throat in Group I (No

Group I (No intervention) (N=166)				Group II (Intervention) (N=215)			
GENDER							
Male	61	36.7	(29.4-44.0)	Male	93	43.3	(36.7-49.9)
Female	105	63.3	(56.0-70.6)	Female	122	56.7	(50.1-63.3)
Total	166	100.0		Total	215	100.0	
P=0.119							
Age Group: Mean= 29.45, Median= 27 (SD± 12.74)				Age Group: Mean= 29.04, Median= 27 (SD± 11.43)			
11-18 Years	38	22.9	(16.5-29.3)	11-18 Years	53	24.7	(18.9-30.5)
19-24 Years	29	17.5	(11.7-23.3)	19-24 Years	39	18.1	(13.0-23.2)
25-34 Years	50	30.1	(23.1-37.1)	25-34 Years	54	25.1	(19.3-30.9)
35-44 Years	27	16.3	(10.4-21.9)	35-44 Years	38	17.7	(12.6-22.8)
45-60 Years	22	13.3	(8.1-18.5)	45-60 Years	31	14.4	(9.7-19.1)
Total	166	100.0		Total	215	100.0	
P=0.877							

Table (1) Continued

House Wife	48	28.9	(22.0-35.8)	House Wife	52	24.2	(18.5-29.9)
Working	58	34.9	(27.6-42.2)	Working	80	37.2	(30.7-43.7)
Retired	11	6.6	(2.8-10.4)	Retired	11	5.1	(2.2-8.7)
					72	33.5	(27.2-39.8)
Total	166	100.0		Total	215	100.0	
P=0.622							

Table (2): Antibiotic Prescription for Group I (No Intervention) and Group II (Intervention)

Group	Antibiotic Prescription	%	(95% C.I)
No intervention	106	63.9	(56.6-71.2)
Intervention	46	21.4	(15.9-26.9)
P=0.000			

Table (3): Consumption of medication, home remedies and traditional medicine by patients prior to their attendance of primary health care clinics.

Group I (no intervention) (N=166)				Group II (intervention) (N=215)			
	N	%	(95% CI)		N	%	(95% CI)
Medication	114	68.7%	(61.6-75.8)	Medication	117	54.4%	(47.7-61.1)
P=0.003							
Home Remedies	62	37.3%	(29.9-44.7)	Home Remedies	71		(26.7-39.3)
P=0.221							
Traditional Medicine	35	21.1%	(14.9-27.3)	Traditional Medicine	54	25.1%	(19.3-30.9)
P=0.212							

Table (4): Comparison of Signs between Group I (no intervention) and Group II (intervention)

Group I (N=166)				Group II (N=215)			
Signs	N	%	(95% C.I)	Signs	N	%	(95% C.I)
Fever	81	48.8	(41.2-56.4)	Fever	118	54.9	(48.2-61.6)
P=0.141							
Throat Yellowish Discharge	85	51.2	(43.6-58.8)	Throat Yellowish Discharge	71	33.0	(26.7-39.3)
P=0.000							
Cough	121	72.9	(66.1-79.7)	Cough	163	75.8	(70.1-81.5)
P=0.297							
Productive Cough	92	55.4	(47.8-63.0)	Productive Cough	118	54.8	(48.1-61.5)
P=0.169							
Runny Nose	96	57.8	(50.3-65.3)	Runny Nose	133	61.9	(55.4-68.4)
P=0.245							
Nasal Yellowish Discharge (n=103)	26	25.2	(18.6-31.8)	Nasal Yellowish Discharge (n=137)	30	21.9	(16.4-27.4)
P=0.325							

Table (5): Comparison of Symptoms between the sample populations

Group I (N=166)				Group II (N=215)			
Symp-toms	N	%	(95% C.I)	Sympt oms	N	%	(95% C.I)
Head-ache	118	71.1	(64.2-78.0)	Head-ache	136	63.3	(56.9-69.7)
P=0.067							
Ear pain	62	37.3	(29.9-44.7)	Ear pain	56	26.0	(20.1-31.9)
P=0.044							
Sore throat	166	100.0		Sore throat	215	100.0	

Table (6): Impact of Significant Confounding Factors on Primary Outcome Measure

Confounding Factors				
Throat yellowish discharge				
	Group I		Group II	
	N	%	N	%
Prescribed antibiotics	60	70.6	25	35.2* P=0.000
Not Prescribed antibiotics	25	29.4	46	64.8
Total suffering	85	100%	71	100%
Ear pain				
	Group I		Group II	
	N	%	N	%
Prescribed antibiotic	41	66.1	14	25.0* P=0.000
Not Prescribed antibiotics	21	33.9	42	75.0
Total suffering	62	100%	56	100%

Table (7): Impact of Age on the Effectiveness of the Intervention on Reducing Antibiotic Prescription in the Two-Study Population

Age	% Antibiotic prescription	
	Group 1 (No intervention)	Group 2 (Intervention)
Younger group (age 14-24 years)	62.7%	17.4%
	P=0.000	
Mature/older Group (age 25-60 years)	64.6%	24.4%
	P=0.000	

Table (8): Impact of Education on the Effectiveness of the Intervention on Reducing Antibiotic Prescription in the Two-Study Population

Education	% Antibiotic prescription	
	Group 1 (No intervention)	Group 2 (Intervention)
Low level education (Illiterate and primary)	63.2%	25.6%
	P=0.000	
High level education (Secondary, high school and university/post grad)	64.1%	20.5%
	P=0.000	