ORIGINAL RESEARCH

The role of patient education in adherence to antibiotic therapy in primary care

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ABSTRACT

AIM: Adherence is an important factor in the achievement of therapeutic outcomes, while patient education is thought to positively affect adherence. The aim of this study is to assess patient adherence to prescribed antibacterial agents impact of patient education on adherence with the therapy.

MATERIALS AND METHODS: This study was a prospective, controlled trial conducted at a community pharmacy in Istanbul, between January and July 2010, among patients who had been prescribed antibiotics. After filling out an initial questionnaire, patients were educated about their antibiotic therapy either in a simple (control group) or more comprehensive way (study group). A second questionnaire, conducted the day after antibiotic therapy ended, focused on how patients had actually used their antibiotics. and based on patients' self reports Adherence was assessed using both a tablet count and a self-report method to explore whether the timing of the doses was correct.

RESULTS AND DISCUSSION: Patients in the study group demonstrated a non-significantly better adherence to therapy than those in the control group. There was no significant difference between the patiens informed and uninformed by the physician in terms of the rates of information request from pharmacist. However, patients who were prescribed a once daily dose regimen for a short duration were found more adherent to antibacterial therapy in terms both of dose-taking (self-administration) and dose-timing ($p < 0.05$). In addition, more mature patients (>30 year-old) were found more adherent than younger people ($p < 0.05$). The potential role of the pharmacist in providing patient education was underscored

KEY WORDS: Adherence, antibacterial agents, patient education, questionnaire, clinical pharmacists.

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INTRODUCTION

The term compliance or adherence can be described as the extent of correlation between the patients' obedience to the therapy and the advice of health providers. Thus, it is related to the patients' drug-taking attitude (1,2). Even when appropriate treatment is prescribed successful results may not be always achieved if patients use their medicines improperly. To attain good results in health status, adherence to the prescribed regimen is considered necessary (3).

Patients can be categorized as adherent or non-adherent. Adherent patients are generally cognizant of their medications and medical condition, and as a result they are more likely to achieve positive therapeutic outcomes. Correct dosing and timing of medication is an important constituent of adherence to the therapy (4). By con-

trast, non-adherent patients do not use their drugs as prescribed by the physician; some use their drugs incompletely while others do not take any medication (5).

Adherence can be affected certain factors such as dose frequency, duration of treatment, pharmacological (adverse effects) and psychosocial factors (dissatisfaction of patient), medical errors such as misunderstood or lack of patient information (3-9).

Antibiotics are efficient, potent, safe and life saving agents used to facilitate the healing of bacterial infections (8).[8] Their introduction has led to an obvious reduction in mortality (10). Unnecessary and/or inappropriate usage of these drugs is a common cause of the development and spread of resistance to them (11). Adherence to antibiotic therapy is improved substantially when verbal and written information is provided in concert (2).

Clinical pharmacy is a synthesis of public health and science which aims to achieve optimum medical treatment, patient wellness and an advanced state of health (12). Because clinical pharmacists are active supporters of rational drug use, they can correct inappropriate or incorrectly prescribed therapies, in consultation with the doctor (12). It has been demonstrated that clinical pharmacy services support patient care and facilitate successful and effective medication use (13).

The aim of this study is to investigate whether patient education, as a clinical pharmacy related practice, given to patients prescribed antibiotics for any type of infections at the beginning of the treatment in a community pharmacy, is effective on adherence or not.

MATERIALS AND METHODS

Study population and study center

This study was a prospective, controlled trial and conducted in a community pharmacy in Acıbadem between the dates of January, 2010 and July, 2010. Consecutive patients that had been prescribed oral antibiotic therapy for any type of infectious diseases were asked to participate in the trial. A total of 60 patients were included in study.

Eligibility criteria

In this study, out-patients who had been diagnosed with various infectious diseases by practitioners or specialists, and to whom oral antibiotic therapy had been prescribed, were enrolled.

Inclusion criteria

Inclusion criteria were to have a prescription including an oral antibacterial agent, and to have given consent to be followed-up and to answer the questionnaires. Outpatients aged ≥18 were included.

Exclusion criteria

Exclusion criteria were to have possible drug interactions between the prescribed drugs; having possible allergic reactions to prescribed antibacterial agents. (These patients were redirected to their doctors.) Outpatients aged under 18 were excluded.

Study group

All patients in the study group were instructed to take their medication according to their physician's recommendations. The pharmacist gave additional instructions about drug usage both orally as well as in writing, with instruction and warning stickers on each container. Moreover, patients were reminded to take their tablets/capsules regularly at the same time everyday and to finish the whole blister or bottle of antibacterial medications, as recommended by the doctor; They were told that if any of the pills were left unused, the treatment might not be as effective against bacteria particularly in case of an acute recurrence of the complaint. Thus, the importance of the potential occurrence of antibacterial resistance was briefly emphasized. Finally, in case, if an adverse effect, patients were instructed to call their doctor and pharmacist immediately.

Control group

Patients in the control group were informed only about the dosage regimen prescribed by the doctor. As in study group, the pharmacist gave instructions about drug usage both orally and as well as in writing with stickers on each drug container in control group. However, no extra information was given about the prescribed dosage regimen in terms of the risks involving resistance if it developed.

Data collection

Patients were informed about the study orally in the first instance. Patients agreed to participate in the study signed the informed written consent before the first questionnaire. Verbal approval was obtained from patients who did not want to sign the consent form. Then, patients answered the first questionnaire which was administered by the pharmacist. In this questionnaire the datas of the socio-demographic characteristics of patient, the health center/organization and specialty of prescribing physician, diagnosis and prescribed drugs, whether or not the physician had informed the patient about drug usage the uninformed patient by the physician was asked if he/she needed more information about usage of drugs, whether or not the physician asked the patient if he/she had a chronic disease requiring medication, apart from the prescribed antibacterial and adjuvant drugs. whether or not the physician asked the patient if he/she had any drug allergy to some sort of medicines. whether or not a bacterial culture had been performed, the time spent for the clinical examination of the patient were collected.

The day after the end of the antibacterial treatment, patients were contacted by phone and asked to help complete a second questionnaire. In this questionnaire, the number of remaining pills in the blister or box, whether the patient omitted to take his/her medication or deliberately missed a dose, how many pills the patient took per day and at what time, regularly or irregularly. whether patient felt much better or not after the antibiotic therapy, whether the patient read the prospectus/printed instructions and directions about his/her antibacterial agent or not.

Phone calls had to be repeated up to 2-3 times because the patient could frequently not be reached at that time of the first call.

Data analysis

The initially measured variable was adherence to prescribed antibiotic regimens. In the absence of a clear consensus in the literature on the definition of measures of adherence, and for the sake of convenience the researchers considered it appropriate to divide adherence into two categories:

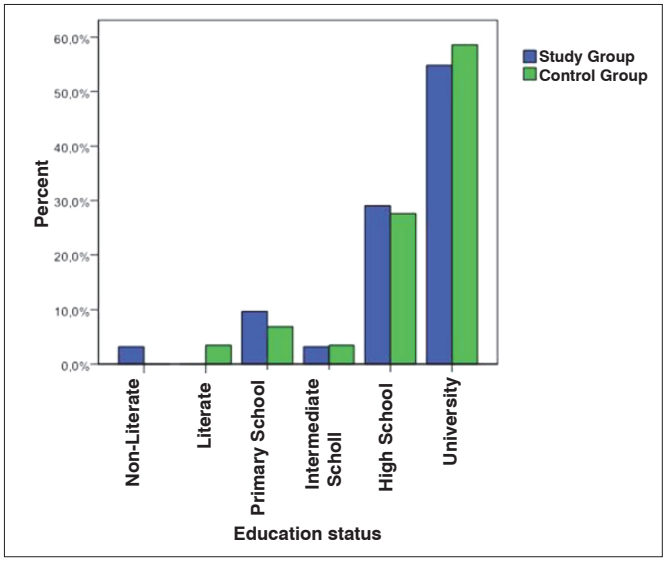

FIGURE 1. Comparative percentages of patients' education status of study and control groups

1. Self-administration Adherence

2. Timing Adherence

To assess self-administration adherence, patients in both groups were asked to count the pills that were left over in the box. According to patient-derived data, the following formula was used:

Pill Count = Pills taken by the patient / Pills prescribed by physician x 100

Patients with a pill count of 100% were defined as adherent in terms of administration. A pill count under 100% was considered as non-compliant in self-administration.

Timing adherence was evaluated according to patients' answers to the 4th question in the second questionnaire. In the 4th question, patients were asked whether he/she took his/her antibiotic pills at the correct times regularly or not. If the answer was 'YES', patients were defined as timing adherent. On the other hand, if the answer was 'NO', patients were considered non-adherent.

Patients who were adherent in both administration and timing categories were named ATA (Administration and Timing Adherent).

Statistical analysis

SPSS software (version 17.0 SPSS Inc., Chicago, IL) was used for statistical analysis and graphics in this trial. The Kolmogorov- Simirinov test was performed for analysis of normality. Chi-square and Fisher's exact tests were used to compare categorical data of binary groups. Normally distributed continuous data was compared with student t-test as an average value; groups of continuous data not showing normal distribution was compared with Mann-Whitney U test as a median value. During the analysis of the correlation, Spearman's rho correlation analysis was used because compared parameters were not normally distributed. A p value of less than 0.05 was regarded as significant .

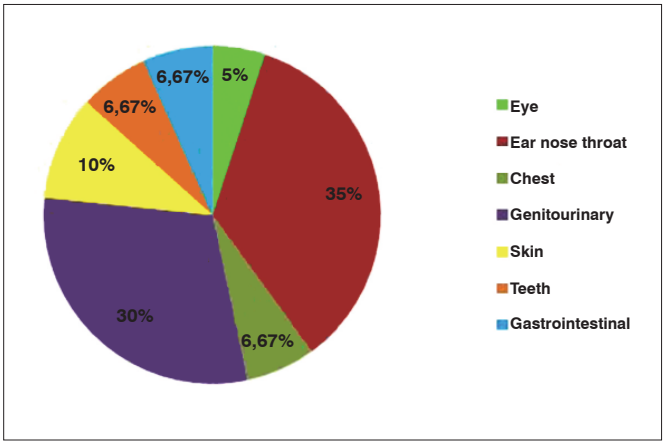

FIGURE 2: Distribution of infections according to anatomical locations (n=60)

Limitations

There were some situations that limited the study listed below.

1. In the current study, the results of the survey do not reflect the data of socio-demographic characteristics of different populations since the survey was done only in one pharmacy.

2. The method used in this trial was based on a self-reported questionnaires. Fakat hastalar telefon görüşmeleri esnasında ilaç kutularında kalan ilaç sayısı sorularak verdikleri bilgiler yine subjektif olarak doğrulanmaya çalışılmıştır.

RESULTS

The mean age of patients enrolled in study group was 37.77±16.52, in the control group it was 34.96±16.10. In the study group, 24 of the patients (77.4%) were female, and 7 (22.6%) were male. The groups were homogenous in terms of age and sex. (p=0.516 Student t-test, p=0.195 Chi Square test respectively) Due to the number of categories, the educational status of the groups was not statistically comparable but the distribution of both groups was observed to be similar, as shown in Figure 1.

Forty nine patients (81.7%) were examined by a specialist in ophthalmology; ear, nose and throat; internal medicine; obstetrics; dermatology; pulmonary medicine, general surgery, dentistry, urology, or infectious diseases.

The remaining eleven (18.3%) were examined by a general practitioner. Most of the patients were diagnosed primarily with upper respiratory tract infections, and secondarily with genito-urinary infections. The frequencies of patients' diagnosis are shown in Figure 2.

Administration adherence was found to be %100 in patients who had been suffering with chest and skin infections; timing adherence was observed to be %100 in eye infections. All of the patients failed to reach 100% in ATA, but patients that had genitourinary infections achieved the highest percentage %77.8. Anatomical locations of these infections according to types of adherent patients are shown in Table 1.

The mean administration adherence for all patients (n=60) was 85.60%±28.17. In terms of the three adherence parameters (administration, timing and ATA), patients in the study group were more adherent to therapy than those in the control group

TABLE 1. Percentages of the types of adherent patients in terms of anatomical localizations of the infections

Anatomical localizations	Administration adherence	Timing adherence	ATA
Eye (n=3)	1(33.3%)	3(100%)	1(33.3%)
ENT (n=21)	17(81.0%)	16(76.2%)	12(57.1%)
Chest (n=4)	4(100%)	3(75.0%)	3(75%)
GU (n=18)	16(88.9%)	15(83.3%)	14(77.8%)
Skin (n=6)	6(100%)	4(66.7%)	4(66.7%)
Teeth (n=4)	3(75.0%)	2(50.0%)	2(50.0%)
GI (n=4)	1(25.0%)	1(25.0%)	0(0.0%)
Total (n=60)	48(80%)	44(73.3%)	36(60%)

ENT: Ear nose throat, **GU:** Genitourinary, **GI:** Gastrointestinal, **ATA:** Administration and timing adherence (patients were considered adherent in both these areas)

TABLE 2. Comparison of the adherence parameters between study and control groups

Adherence parameters	Study Group n(%)	Control Group n(%)	p values
Administration adherence Adherent	26(83.9%)	22(75.9%)	0.438*
Timing adherence Adherent	25(80.6%)	19(65.5%)	0.185*
Administration and timing adherence Adherent	20(64.5%)	16(55.2%)	0.460*

*Chi Square test

TABLE 3. Correlation between administration adherence and time taken for clinical examination, amount in tablets/capsules in the medicine container, and the number of days of therapy

	R	p values
Examination period-Administration adherence %	0.182	0.164*
No. of pills in container-Administration adherence %	-0.257	0.048*
Number of days of therapy- Administration adherence %	-0.260	0.045*

*Spearman's rho correlation coefficient

TABLE 4: The effect of examination time, number of tablets/capsules in the container and number of days of therapy on administration and timing adherent patients

	ATA	Not ATA	p values
Examination period/minute (mean ±SD)	14.30±9.63	13.70±8.14	0.798*
No. of pills in container (mean ±SD)	8.87±4.32	12.33±4.35	0.003*
Number of days of therapy (mean ±SD)	5.69±2.20	7.07±2.23	0.007**

***Student T test, ** Mann-Whitney U test, **SD:** Standart Deviation

but this difference was not found to be statistically significant. (see Table 2)

Our analysis showed that there was a statistically significant negative correlation between administration adherence and the mean number of tablets/capsules in the medicine container, and also between adherence and the number of days of therapy. The length of clinical examination did not significantly affect the adherence (Table 3). Similar data was also obtained when examination time, pill number and length of therapy were compared with ATA (Table 4).

A number of factors that may affect compliance were evaluated as seen in Table 5. Timing-adherence and ATA were found significantly more common in patients aged >30 than in younger adults. However, significant differences were not observed in terms of administration adherence alone.

The percentages of physicians who provided their patients with information about their medications, and patients' self-reported request for information from the community pharmacist are shown in Table 6. There was no significant difference between the patients informed and uninformed by the physicians interms of the rates of information request from the community pharmacist. (p=0.136, Chi Square test)

DISCUSSION

The structured education given to patients by physicians and pharmacists may increase adherence to prescribed antibiotic therapy. Many studies prove that if patients are given simple information about their medications not only verbally, but supported by written instructions, non-adherence rates decrease and optimal therapeutic outcomes are obtained (2,4). On the other hand, one study showed that patients did not adhere to penicillin treatment even although they were educated about their disease and aim of the treatment (14). In our study, the community pharmacist offered brief, practical advice to participants about the prescribed antibiotic regimen both verbally and in writing. As noted above, there was no statistically significant difference between the study and control groups in terms of adherence. However, administration, timing and ATA rates were found higher in the study group than control group. The lack of significance may be due to the small numbers of patients in this study, but perhaps also by the fact that there were not major differences between the information provided to study and control groups. Both groups received verbal and written information regarding how to use the medication; the only difference was that the study group was provided with more comprehensive information regarding antibiotic resistance and side effects. If the control group had not received any information at all regarding their medication either from the physician or the pharmacist, then a more clear difference could have been observed. However for ethical reasons it was not judged professional to totally deprive patients of at least a basic level of pharmacist-led education; and it appears that this basic information about the dose and frequency of the medication is what makes the difference between adherence and non-adherence.

TABLE 5. Comparison of the factors that may affect adherence

Factors that may affect adherence	Fully adherent n(%)	Not fully adherent n(%)	p values
Age			
18-30	15(41.7%)	17(70.8%)	0.027*
31≤	21(58.3%)	7(29.2%)	
Gender			
Female	26(72.2%)	16(66.7%)	0.645*
Male	10(27.8%)	8(33.3%)	
Work Status			
Working	24(66.7%)	19(79.2%)	0.293*
Not working	12(33.3%)	5(20.8%)	
Specialty of physician			
General practitioner	6(16.7%)	5(20.8%)	0.741**
Specialist	30(83.3%)	19(79.2%)	
Information given by physician			
Yes	30(83.3%)	15(62.5%)	0.068*
Patient needs information from the pharmacist			
Yes	18(50%)	12(50%)	1*
Reading package insert			
Yes	18(50%)	10(41.7%)	0.526*
Patients using other drugs			
Yes	25(69.4%)	14(58.3%)	0.377*
Allergy			
Yes	1(2.8%)	3(12.5%)	0.292**
Prescribed dose regimen			
1	15(41.7%)	6(25%)	0.185*
2-3	21(58.3%)	18(75%)	

*Chi Square test, ** Fischer's Exact test

TABLE 6. The proportion of patients who require education about their medication from the pharmacist; and patients informed by physicians

	No (%) of patients who desire to receive information about their medication from the pharmacist	*p value*
	Yes	
Information about medications provided by physician		
Yes	20 (44.4%)	
No	10 (66.7%)	0.136*

Similarly, although there was no significant adherence difference between the groups educated by the physicians versus those who had not been educated, all types of adherence rates were found higher in the better informed group. From another angle, 50% of all participants reported that they felt they would like to receive more information from the community pharmacist about their conditions and prescription medications. This ratio was 44.4% even among participants who claimed that their physicians informed them adequately. Although results of our study show that extra physician-led patient education does not affect adherence significantly, they suggest that, regardless of physician information, patients would like to be educated by their community pharmacists.

Different methods have been used for measuring patient adherence and in general, they are categorized as subjective and objective methods. While subjective methods includes self-reported questionnaires and telephone interviews, objective methods are known as electronic monitoring system, pill count and blood/urine tests (15). A review study shows that 67.2% of different studies used subjective measurement and adherence rates were higher (66.0%) than objective measurements (55.6%). In another trial, adherence was found higher when telephone interviews (68.2%) were employed to evaluate adherence than electronic monitoring system (30.0%) (16). In our study, two subjective methods, questionnaire and telephone interview, were combined to measure the adherence to therapy. In agreement with the same research (16), the adherence rate in our study was observed 60% in ATA patients. If an objective method had been used, it can be anticipated that a lower rate of adherence would have been obtained.

Socio-demographic characteristics such as age, gender, education, and work status have been considered to have a potential impact on adherence; although several studies have shown that these factors do not affect the adherence rates (3-4,14). Results of our study partially confirm these findings. Gender, education and work status were not found to significantly influence adherence. However, patients older than 30 years were found more adherent to antibacterial treatment. A review article supports our data regarding age outcomes; young participants aged between 18 and 29 were found non-adherent to prescribed antibiotic therapy (5). [5]This finding may be related to the attitudes of patients because with an increasing age, they become more careful and conscientious about their treatments and health status.

There are various other factors that have been documented as being able to influence adherence. Dose frequency has been observed to be one of the most critical factors in terms of adherence. In a review of studies, the frequency of prescribed dose regimen was found to be inversely proportional to adherence rates (3-4). Apart from frequency, another important factor is the duration of therapy; it has been shown that patients' adherence to therapy is increased in short-duration treatments

(4,6-7,9). With respect to frequency of doses and length of treatment, our findings verified these studies cited above. In our study, patients who were prescribed a once daily dose regimen for a short duration were found more adherent to antibacterial therapy in terms both of dose-taking and dose-timing. This situation can be interpreted in the following way: the simplicity of treatment may preclude the patients skipping doses and facilitate the administration of their medications at the correct dose and frequency.

The number of prescribed pills may impact adherence. Although we could not find much literature to support this claim, our study brought to light a statistically significant negative correlation between adherence and quantity of antibiotic prescribed, such that when the average number of tablets/capsules prescribed decreases, it was observed that patients were more adherent to therapy.

Patients who prefer to be examined by a specialist physician or those who read the drug package insert before starting to use their medicine may be postulated to be more disposed to demonstrate adherence. In contrast, it could be assumed that patients taking one or more different medicines regularly for chronic conditions will have a lower adherence to therapy with the addition of an antibacterial agent. Similarly, patients who have an allergic reaction to one particular drug may feel concerned generally about drug intake and may demonstrate low adherence rates to prescribed antibacterial regimen. However, according to our research none of these potential factors had a positive or a negative effect on compliance.

CONCLUSION

Pharmacists may be able to play a role in providing pharmaceutical care to patients receiving antibiotic treatments and; can help to ensure patients use their medications appropriately and enhance rational antibiotic use. The rates of the information request of the patients were independent from the rates of information given by the physicians. This issue underlines the importance of patient education given by the pharmacists.

The results of our study suggest that patients under the age of 30, who are receiving multiple-dose, long term antibiotic regimens could benefit from more comprehensive patient education aimed at increasing their adherence to therapy.

Further researches in this field may demonstrate the benefit and importance of the clinical pharmacist in antibacterial therapy, by comparing adherence and clinical outcomes of patients where clinical pharmacy services are offered compared to routine practice.

Birinci basamak sağlık hizmetinde antibiyotik tedavisine uyunçta hasta eğitiminin rolü

ÖZET

AMAÇ: Uyunç, tedavide daha iyi sonuçlara ulaşmada belirgin bir role sahiptir. Bilgilendirilen hastalar kendilerine reçetelenen ilaçlar hakkında bilinçli oldukları için, hasta eğitimi ile uyunç birbiri ile ilişkilidir. Bu çalışmanın amacı antibakteriyel ajan reçetelenmiş hastalarda uyuncu ölçmek ve hasta eğitiminin uyunç üzerindeki etkisini değerlendirmektir.

MATERYAL ve Metot: Bu çalışma, prospektif ve kontrollü bir çalışma olup, Ocak 2010 – Temmuz 2010 tarihleri arasında antibiyotik reçete edilmiş hastalarla gerçekleştirildi. Hastalara biri tedavinin başında; ikincisi antibiyotik tedavisinin sona erdiği günün sonunda olmak üzere iki farklı anket yapıldı. İlk anket hastaların sosyo-demografik bilgilerini, hastalıkları ve ilaçları hakkında bilgiye ihtiyaçları olup olmadığına dari sorular, ikinci ankette ise, antibiyotik tedavisi bittikten bir gün sonra antibiyotik ajanları nasıl kullandıkları ile ilgili sorular içermektedir. Uyunç ve dozların doğru zamanda alınıp alınmadığı, tablet sayımı ve kişinin kendi beyanatına dayalı rapor metotlarıyla değerlendirilmiştir.

BULGULAR ve Sonuç: Bu çalışmada, çalışma ve kontrol grupları arasında eczacı tarafından verilen bilgiye göre doz alımı, doz zamanlaması, alım ve zamanlama uyuncu (AZU) açısından istatistiksel fark bulunamadı. Hekim tarafından bilgilendirilen ve bilgilendirilmeyen hastalar arasında, eczacıdan bilgi talebinde bulunma oranları açısından anlamlı fark saptanmadı. Diğer katılımcılarla karşılaştırıldığında, daha az miktarda ilaç ve daha kısa süreli tedavi reçete edilen katılımcılarda ilaç alım yüzdesinde artış görüldü. Bununla birlikte 30 yaşın üzerindeki yetişkin hastalar, genç hastalara göre daha yüksek uyunç gösterdi. Eczacıların hasta eğitimi üzerindeki güçlü rolünün altı çizildi.

ANAHTAR KELİMELER: uyunç, antibakteriyel ajanlar, hasta eğitimi, anket, klinik eczacılar

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