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ORIGINAL REPORT

Assessment of medication knowledge and adherence among patients under oral chronic medication treatment in community pharmacy settings

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ABSTRACT

Purpose This study aimed to determine whether there is a relationship between the lack of medication knowledge and the self-reported rates of patient medication adherence.

Methods Patients eligible to participate in the study had been taking oral medication at least once daily over the course of a minimum of three consecutive months before recruitment to the study. All participants were older than 18 years. The level of each patient's knowledge of his or her medication was randomly assessed by a trained fifth-year pharmacy student through an adapted questionnaire. In addition, patient adherence was evaluated via utilization of the Morisky Medication Adherence Scale.

Results Of the 765 study participants (mean $\pm$ SD age = 55.45 ± 15.05 years, range = 20–91 years, 56.2% women), 58.0% reported adherence to their medication regimen and 64.5% professed optimal knowledge of their medication. The mean duration of medication utilization was 26.77 ± 40.62 months (range = 3–504 years). A statistically significant correlation exists between the total medication knowledge score on the questionnaire and the level of medication adherence ($r = -0.964$, $p < 0.001$).

Conclusion Improvement in the patient's knowledge of medications taken would bear a positive effect on medication adherence.

KEY WORDS—community pharmacy; medication adherence; medication knowledge; pharmacoepidemiology

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INTRODUCTION

Studies conducted in developed countries reveal that approximately 50% of patients with chronic illnesses do not regularly take their medications as prescribed.[1] Medication-related problems can constitute an important burden on public health care. Increases in morbidity and mortality rates as well as therapy-related costs—such as longer hospital treatment—can be attributed to low adherence to medication regimens.[2] Hope *et al.*[3] found that lower medication adherence and lack of knowledge of prescribed dose were the main reasons for increases in the number of emergency department visits among congestive heart failure patients aged 50 years and older.

Patient adherence to therapy is one of the most important factors in therapeutic success. Therefore, healthcare provider cooperation with patients as regards adherence is critical to the therapeutic process. During the therapeutic process, health professionals regularly inform patients of the perceived risks and benefits of their medication. The management of care such as pharmacotherapy determination and monitoring should integrate patient involvement to expand patients' perceptions and therapy-related knowledge.[4]

Individualized patient education would be necessary to attain the desired medication adherence in special patient populations such as those undergoing therapy in pediatrics and geriatrics or for chronic diseases. Patient trust in medication is highly related with patient knowledge in answering questions on what the medication is for, when it should be taken, and how it should be taken.[5]

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The Morisky Medication Adherence Scale,[6] among the most widely accepted medication adherence scales, was used in this study. The self-reported Morisky Medication Adherence Scale was shown to be significantly associated with patients' antihypertensive medication pharmacy refill adherence records.[7] It was found that self-reported medication adherence assessment could be used to detect nonadherence of patients with chronic obstructive pulmonary disease[8] and patients with inflammatory bowel disease.[9] The Morisky Medication Adherence Scale was found to be sensitive to nonadherence and moderately correlated with pill count for patients with Parkinson's disease.[10]

This study aimed to investigate whether lack of medication knowledge can be linked to patients' self-reported medication adherence.

METHODS

This cross-sectional study was conducted at 60 community pharmacies in Istanbul from March through May 2011 in Istanbul. The fifth-year pharmacy students at each pharmacy gathered data during their clinical pharmacy internship hours, from 10:00 AM to 6:00 PM, 2 days a week.

Patient-oriented internship activities coordinated under the auspices of the Clinical Pharmacy Department are part of the core curriculum in the fourth and fifth years of pharmacy education at the Marmara University Faculty of Pharmacy. They aim to develop student pharmaceutical skills in patient-oriented pharmacy through observations at community pharmacies and hospital wards as well as problem-solving-based learning at pharmaceutical laboratories. Students performed clinical pharmacy tasks such as filling out patient profiles, providing drug information, and counseling patients during their internship hours at selected community pharmacies. As part of their assignment, students filled out a profile form for each patient with a chronic disease and collected information to assess the patient's knowledge of their medication. Finally, the students prepared patient educational handouts for the relevant medications.

The study is designed to comply with The Code of Ethics of the Declaration of Helsinki. All study participants were fully briefed, and data were collected only for those patients who provided their consent. All community pharmacy owners participating in this study were also briefed by the authors, and their consent was received.

All participants were older than 18 years. Patients eligible for the study had been taking oral medication for at least the preceding 3 months. Excluded were patients with cognitive or perceptual problems.

Demographic patient data such as age, gender, and education level were recorded in face-to-face interviews at the community pharmacies. Educational level was determined to be "≥high school degree" if the total duration of education was greater than or equal to 8 years and "<high school degree" if the total duration of education was less than 8 years. Patient drugs were classified according to the Anatomical Therapeutic Chemical (ATC) Classification System.

Patient knowledge was evaluated through administration of a questionnaire (Table 1) adapted from the study by McPherson *et al.*.[11] During the appointment, trained fifth-year pharmacy students first asked the participants for the names of all medications they were

Table 1. Medication knowledge evaluation tool

	Score
Question 1: Can you list the names of all medications you are currently taking?	
Correct if participant states either generic or brand name	1
Participant does not know	0
Question 2: Can you tell me why you are taking this medication?	
Participant can state medication's exact working mechanism	2
Participant correctly states reason for administration of medication	1
Participant does not know	0
Question 3: Do you know how to take your medicine?	
Participant can correctly describe administration method for this medication (e.g. tablet; swallowing the tablet whole with plenty of water)	1
Participant does not know	0
Question 4: Do you know when to take your medicine?	
Correct if participant correctly describes when to take this medication (i.e. on an empty stomach)	1
Participant does not know	0
Question 5: Do you know the possible side effects of your medicine?	
Correct if participant can state medication side effects, including those not experienced by patient	1
Participant does not know	0
Question 6: Do you know what to do if your medication's side effects occur?	
Correct if participant states they would call their physician/pharmacist, stop taking the medication, or other self-management intervention methods when faced with side effects	1
Participant does not know	0
Question 7: Do you know what to do if you miss a dose of your medicine?	
Participant says he or she never forgets a dose, he or she takes the next scheduled dose, or he or she calls physician or pharmacist	1
Incorrect if participant does not know or declares he or she doubles up on doses	0

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taking. If the participants stated either the brand or generic name of their medications, the interviewer recorded this as a correct response. They then asked each patient all other questions—directions for use, dosage timing, medication side effects, and participant attitude when a dose was missed—regardless of the patient's initial response. If the patient was taking more than one oral medication at the time of the interview, data were collected for only one randomly chosen drug. A random drug was used for the purpose of increasing applicability in the present study because of participant time restrictions. The distribution of this drug is shown in Figure 1.

A number of correct responses were used to assess the total medication knowledge score. An additional one point was granted to each participant if the exact mechanism of their medication was stated correctly. In the study, the relationship between total score on medication adherence and medication knowledge was sought. Because we determined that question 7 (participant attitude regarding missed doses) in the medication knowledge questionnaire was directly associated with medication adherence, the total medication knowledge score was calculated without question 7 in the medication knowledge questionnaire. The aim of using the Morisky Medication Adherence Scale instead of question 7 is the assessment of medication adherence via a widely accepted scale and also to obtain more valuable data through this method. Therefore, the total medication knowledge score was evaluated out of seven on a total of six questions in the questionnaire for each participant. All participants were also asked whether they were informed of the long-term benefits of medication adherence by their physician or pharmacist.

The Morisky Medication Adherence Scale was used to determine participants' self-reported medication adherence rates and comprised four questions[6]: "Do you ever forget to take your medicine?" "Do you ever have trouble remembering to take your medication?" "Do you feel better when you stop taking your medication?" "If you feel worse while continuing your medication, do you ever stop taking it?" In our sample, Cronbach's alpha was 0.62, which is consistent with previously reported reliability estimates.[6] Each question was scored as 1 for "yes" and 0 for "no." The total medication adherence score ranged from 0 to 4. A total score of 0 or 1 was considered to constitute adherence. If the total score was ≥ 2, the patient was classified as nonadherent.[12]

The total medication knowledge score and adherence scale according to gender, education level, age (<65 years old and ≥ 65 years old), and duration of medication use (<1 year and >1 year) were analyzed using the Mann–Whitney U test. The relationship between the total medication knowledge score and the adherence scale was analyzed through Spearman rank order correlation. The odds ratio was evaluated based on the chi-square test or Fisher's exact test for categorical variables. Results are assumed to be significant when $p < 0.05$ for all statistical analysis.

RESULTS

Data on a total of 765 patients were analyzed in this study. The mean age of participants was 55.45 ± 15.05 years (range = 20–91), and 56.2% of participants were women; 72.4% of them used their medication throughout a period equal to or less than 1 year. The most frequently analyzed medications were cardiovascular system (44.2%), alimentary tract and metabolism (18.8%), and central nervous system (18.0%) medications, based on their ATC classification (Figure 1).

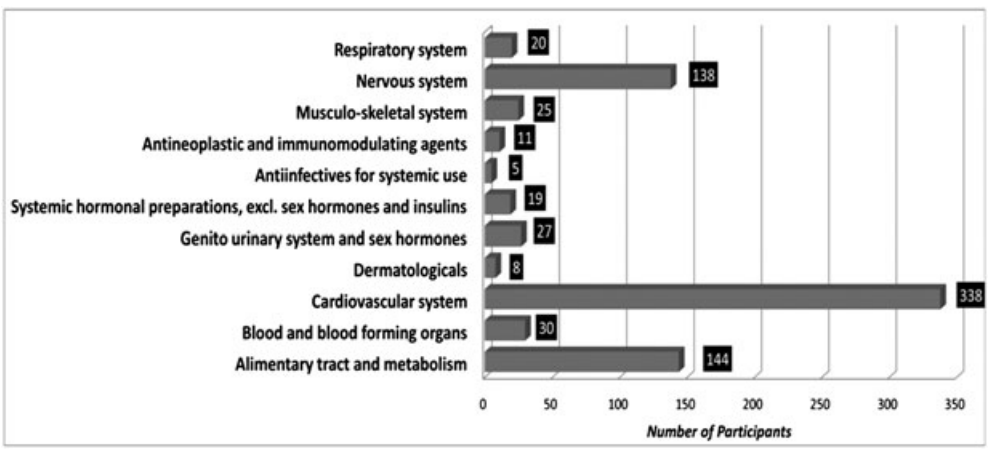

Figure 1. The categories of participants' randomly selected medications according to the ATC classification system

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High school graduates comprise 68.6% of the participants. The mean ± SD values of knowledge score and medication adherence were 4.84 ± 1.57 and 1.45 ± 1.22, respectively. Of the participants, 58.0% were adherent to their medication regimens whereas 64.5% possessed optimal knowledge regarding their medication. Only 2.7% of all participants were able to answer all questions related to medication knowledge correctly.

There was a significant correlation between the total medication knowledge questionnaire score and the medication adherence scale ($r = -0.964$, $p < 0.001$). Participants with high school degrees demonstrated better medication adherence as well as higher knowledge scores compared with those without high school degrees ($p < 0.001$) (Table 2). Moreover, female subjects younger than 65 years with a medication usage duration of less than 1 year had higher medication knowledge scores ($p < 0.05$, $p < 0.001$, and $p < 0.05$, respectively) (Table 2).

Higher medication knowledge scores could be significantly linked to medication adherence (OR = 2.56, 95% CI = 1.90–3.45, $p < 0.001$) (Table 3). In the study at hand, female gender was correlated with high medication knowledge (OR = 0.73, 95%CI = 0.54–0.98, $p < 0.05$). Advanced age (≥65 years old) was significantly related with low medication knowledge (OR = 0.29, 95%CI = 0.21- 0.41, $p < 0.05$) and adherence (OR = 0.70, 95%CI = 0.51- 0.97, $p < 0.05$) (Tables 3 and 4). Participants with high school degrees had higher medication adherence rates (OR = 1.81, 95%CI = 1.30–2.53, $p < 0.001$) (Table 3) and better medication knowledge (OR = 4.08, 95%CI = 2.89–5.77) (Table 3). Medication usage durations of less than 1 year were significantly correlated with high medication knowledge scores (OR = 0.66, 95%CI = 0.48–0.91, $p < 0.05$) (Table 3).

Table 3. Predictors of high medication adherence

Variable	OR (95%CI)	*p*
High medication knowledge*	2.56 (1.90–3.45)	$p < 0.001$
Patients with high school education	1.81 (1.30–2.53)	$p < 0.001$
Patients younger than 65 years	0.70 (0.51–0.97)	$p < 0.05$
Patients not informed of the benefits of long-term medication adherence by their healthcare providers	1.82 (1.33–2.50)	$p < 0.001$

*Patients with a total score ≥5 on medication knowledge questionnaire. $p < 0.05$ indicates a statistically significant difference between groups.

Patient knowledge pertaining to the names of all medications taken, medication side effects, and attitudes if medication side effects occurred or a dose was missed was associated with greater adherence to medication regimens ($p < 0.001$) (Table 5).

The study revealed that 28.6% of participants were unaware of the long-term benefits of their medication. It was found that participants' lack of long-term benefit information on medication was significantly correlated with overall medication knowledge (OR = 2.96, 95% CI = 2.13–4.10, $p < 0.001$) and medication adherence (OR = 1.82, 95%CI = 1.33–2.50, $p < 0.001$).

DISCUSSIONS

The study results indicate that there is a significant correlation between medication knowledge score and medication adherence ($r = -0.964$, $p < 0.001$). According to the results of a previous cross-sectional study conducted with the participation of 150 patients with chronic diseases who expressed difficulties with taking their medications, a positive correlation between medication knowledge and medication adherence ($r = 0.203$, $p < 0.05$)[13] was found.

In the present study, it was also concluded that female gender, higher educational levels, younger age, and

Table 2. The distribution of participants according to demographic variables and the results of medication adherence scale and medication knowledge evaluation

		Mean medication adherence score		Mean medication knowledge score	
		Mean ± SEM	*p*	Mean ± SEM	*p*
Gender					
	Female	1.42 ± 0.60	NS	4.17 ± 0.08	$p < 0.05$
	Male	1.50 ± 0.07		3.95 ± 0.07	
Education					
	≥High school degree	1.32 ± 0.06	$p < 0.001$	4.48 ± 0.06	$p < 0.001$
	<High school degree	1.66 ± 0.08		3.40 ± 0,08	
Age					
	<65 years old	1.41 ± 0.05	NS	4.26 ± 0.06	$p < 0.001$
	≥65 years old	1.57 ± 0.08		3.47 ± 0.08	
Duration of medication utilization					
	≤1 years	1.45 ± 0.05	NS	4.09 ± 0.06	$p < 0.05$
	>1 years	1.47 ± 0.08		3.90 ± 0.09	

NS, nonsignificant.

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Table 4. Predictors of high medication knowledge*

Variable	OR (95%CI)	*p*
Patients with high school degree	4.08 (2.89–5.77)	$p < 0.001$
Patients younger than 65 years	0.29 (0.21–0.41)	$p < 0.05$
Female	0.73 (0.54–0.98)	$p < 0.05$
Patients using medication for less than 1 year	0.66 (0.48–0.91)	$p < 0.05$
Patients not informed of the benefits of long-term medication adherence by their healthcare providers	2.96 (2.13–4.10)	$p < 0.001$

*Patients with total score ≥5 on medication knowledge questionnaire. $p < 0.05$ indicates a statistically significant difference between groups.

shorter medication duration bore positive effects and correlated with higher medication knowledge scores. Marks *et al.*[14] recorded that the percentages of participants stating correct drug names, dosages, indications, and at least one side effect were 55.8%, 93.4%, 78.8%, and 11.7%, respectively. The study concluded that subject characteristics such as age, highest grade completed, and gender were correlated with the medication knowledge score. The current study results also verify similar outcomes.

The present study also revealed lower rates of medication knowledge and adherence among older patients. Kripalani *et al.*[15] found that inadequate literacy skills resulted in reduced medication management capacity in elderly patients, which was defined by Maddigan *et al.*[16] as "the cognitive and functional ability to self-administer a medication regimen as it has been prescribed." Guenette *et al.*[17] previously discovered that 69.4% of elderly patients knew the purposes of all their prescription and nonprescription medications. Modig *et al.*[18] determined that 71% of elderly patients knew at least 75% of the indications of their medication. Sancar *et al.*[19] found that 54.8% of geriatric patients did not know the purpose of their medication, and 60.3% of them were not aware of how or when they should take their medications. McPherson *et al.*[10] found significantly lower medication scores in patients aged 65 years and older compared with younger patients with diabetes. In the study, which aimed to identify medicine-taking practices among community-dwelling people aged 75 years and older, 75% of participants had high or medium adherence scores, 57% of them knew the purpose of all their medicines, and 17% of participants wanted to learn more about their medicines.[20]

Table 5. Relationship between medication adherence and correct responses to each item in the medication knowledge evaluation tool

	Medication adherent	
	OR (95%CI)	*p*
Names of all medications	2.26 (1.67–3.07)	$p < 0.001$
Purpose of medication	1.24 (0.78–1.98)	NS
Medication directions for use	0.89 (0.41–1.92)	NS
Medication timing	1.60 (0.79–3.26)	NS
Medication side effects	2.46 (1.73–3.48)	$p < 0.001$
Attitudes if medication side effects occurred	2.46 (1.73–3.48)	$p < 0.001$

NS, nonsignificant.

Medication adherence was significantly correlated with participant knowledge of medication names and side effects and patient attitudes when medication side effects presented in the present study. In a cross-sectional study of 348 subjects, 60% knew the purpose of treatment for at least 75% of their medications, and 21% understood the consequences of drug omission or a dose reduction. In addition, the adherence scores were positively correlated with both knowledge of the treatment purpose and understanding of the consequences of omission. A relationship between knowledge of toxicity risks and adherence could not be verified.[21] However, the present study revealed that participant knowledge of side effects and their attitudes correlated to medication adherence.

In the present study, participants' lack of information about long-term benefits of medication adherence was found to have a significant association with medication knowledge and medication adherence. Medication adherence is still an important problem in many countries. Pharmacists can play a critical role in increasing medication adherence, especially in chronically ill patients. There have been many studies contending that pharmacist-led pharmaceutical care, including medication counseling and monitoring, would improve patient medication adherence.[22,23] In further studies, the possible influence of pharmacists on patient medication knowledge and the association of this with their medication adherence could be investigated.

There were some limitations to the present study. Because of concerns over the easy and quick application of this scale, only one oral medication used for at least 3 months by each participant was evaluated. The selection of this medication was conducted through the random choice of trained pharmacy students during the interviews with study participants.

As a consequence of this limitation, a larger sample size (a total of 765 vs 98 and 152, respectively) was obtained in the present study when compared with other studies[14,15] analyzing participants' medication knowledge by asking them to bring all their medication to routine clinical appointment. However, the assessment of participant medication knowledge according to only one of their medications could be controversial. The competencies of the trained pharmacy students in evaluation using medication evaluation tools according to

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participant responses were also among the limitations of the present study. Within the context of the study,[24] which investigated the feasibility of pharmacy students in a pharmacovigilance program in the community pharmacy setting, it was found that trained pharmacy students would be successful in detecting and reporting adverse drug reactions with adequate courses and practical application concerning clinical pharmacy as a part of their pharmacy education.[24]

Participants in this study were selected from among patients who visited the community pharmacy to get their prescriptions filled. Therefore, the study's starting point was the analysis of the entire population, including patients who do not fill or refill their medications, but was rather the mere determination of a possible relationship between medication knowledge and characteristics of patients with self-reported levels of adherence.

The self-reported adherence measure is simple, direct, and inexpensive; however, this method has some disadvantages, such as the recall bias, the possibility of overestimating compliance, and the tendency to evoke socially acceptable responses.[25] The choice of the self-reported method to measure medication adherence could also be controversial. There is a realistic probability that some subjects exaggerate their adherence. A method different from self-reported adherence measures that reflects actual adherence data would have been much more valuable.[1] A previous study comparing electronic prescription data with dispensing data generated a more accurate measure of what was prescribed and what was dispensed. Dispensation did not guarantee that the medication was actually taken; however, it could possibly be a more accurate adherence measure.[26] It is noteworthy that there is no gold standard for measuring medication adherence.[1]

Improving patient medication knowledge will bear a positive effect on medication adherence. Detecting patient levels of medication knowledge and adherence together with possible risk factors such as age, gender, or education level will provide subjective predictions of effectiveness throughout medication therapy.

KEY POINT

- The study results indicate that there is a significant correlation between medication knowledge score and medication adherence.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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