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Impact of antimicrobial drug restrictions on doctors' behaviors

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Background/aim: Broad-spectrum antibiotics have become available for use only with the approval of infectious disease specialists (IDSs) since 2003 in Turkey. This study aimed to analyze the tendencies of doctors who are not disease specialists (non-IDSs) towards the restriction of antibiotics.

Materials and methods: A questionnaire form was prepared, which included a total of 22 questions about the impact of antibiotic restriction (AR) policy, the role of IDSs in the restriction, and the perception of this change in antibiotic consumption. The questionnaire was completed by each participating physician.

Results: A total of 1906 specialists from 20 cities in Turkey participated in the study. Of those who participated, 1271 (67.5%) had ≤5 years of occupational experience (junior specialists = JSs) and 942 (49.4%) of them were physicians. Specialists having >5 years of occupational experience in their branch expressed that they followed the antibiotic guidelines more strictly than the JSs ($P < 0.05$) and 755 of physicians (88%) and 720 of surgeons (84.6%) thought that the AR policy was necessary and useful ($P < 0.05$).

Conclusion: This study indicated that the AR policy was supported by most of the specialists. Physicians supported this restriction policy more so than surgeons did.

Key words: Antibiotic policy, antibiotic restriction, antibiotic usage, budget execution instructions, specialist

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1. Introduction

Antibiotics are one of the most valuable, crucial, and life-saving drugs of the last century. However, antibiotic resistance emerged right after their usage, and today this problem threatens the world. In addition, the uncontrolled and irrational usage of antimicrobials has increased treatment costs. Moreover, treatment failures may occur due to infections caused by antibiotic-resistant bacteria (1,2). Today, the number of newly discovered antibiotics is quite limited. Thus, new strategies to protect antibiotics should be considered.

In Turkey, antibiotics constitute 15%–20% of all prescribed drugs (3). Antibiotics have been number one on the list of the most commonly used drugs for many years. The main reasons behind their unnecessary and irrational usage may be related to a lack of knowledge on antibiotics due to shortcomings in medical training, pressure and promotions by the pharmaceutical industry, the absence of an antibiotic policy, and national antibiotic guidelines (4). The restriction of certain broad-spectrum antibiotics is an important strategy for the rational usage of antibiotics. An antibiotic restriction (AR) policy was shown to enhance the "rational usage" of antibiotics and to reduce financial expenditure (5).

Before 2003, every specialist in Turkey was able to prescribe any antibiotic. However, a law enacted in 2003 stipulated that certain broad-spectrum antibiotics (such as carbapenems, vancomycin, teicoplanin, linezolid, daptomycin, piperacillin/tazobactam, etc.) could only be prescribed with the approval of an infectious disease specialist (IDS). In brief, if a patient was to be given a certain broad-spectrum antibiotic, it could only be prescribed after the approval of an IDS. This AR policy forms two groups of specialists: IDSs and doctors who are not infectious disease specialists (non-IDSs). This creates a negative perception among non-IDSs. While some non-IDSs consider this approach positive and useful, the majority of non-IDSs feel that it is useless and that it hampers patient services, or that it might restrict specialists' rights (6).

What kind of an impact did the AR policy have on non-IDSs? The literature search that we conducted did not reveal any relevant studies. The aim of this study was to examine how the AR policy is perceived by non-IDSs and what kind of behavioral changes it caused. This study is the first to be carried out in the 8 years since the AR law passed.

2. Materials and methods

2.1. Study design

This was a multicenter study conducted between August and December 2011. In sample size calculation, the approach of achieving a number of participants 50 times greater than the number of scale items used in scale studies was preferred. We planned to conduct the study with 1000 participants from each junior and senior specialist group because there were 20 items on the scale. For the study data to be homogeneously distributed over the country, 39 tertiary hospitals from different cities in several regions of Turkey were determined. The IDSs of those centers were contacted via email and were invited to participate in the study. The centers were asked to reply to the invitation within 1 month. Of these centers, 27 replied affirmatively. A questionnaire as well as an electronic form prepared for the centers to note down the results were sent to the participating centers via email. Each center was asked to contact 50 surgeons and 50 physicians, conduct a face-to-face interview to complete the questionnaire forms, and record the answers electronically. Finally, the collected forms were emailed to the coordinating center. Specialists with ≤5 years of professional experience after the specialty period were considered "junior specialists" (JSs), and those with >5 years of professional experience were considered "senior specialists" (SSs).

2.2. Survey

The first part of the questionnaire included questions about demographic data, such as the area of specialization, sex, duration of work in the profession or in the area of specialization, current place of employment (state hospital, training hospital, university hospital, private hospital), and whether the hospital had an IDS or not.

In the second part of the questionnaire, the Scale of Specialists' Perception Regarding Antibiotic Restriction (SSPRAR) was used to examine the changes in AR brought by the Health Application Communique (HAC) and the role of the IDS in the restriction and antibiotic consumption. Two open-ended questions in the scale evaluated the knowledge of the participants on rational usage of antibiotics and their behavior when they needed to prescribe antibiotics requiring IDS approval.

2.3. SSPRAR

This is a scale developed by the research team that included questions to be answered by non-IDSs. It initially included 20 items but was later reduced to 14 items through reliability analysis. Respondents were expected to rate each item using a 5-point Likert type scale (4 = strongly agree, 3 = agree, 2 = disagree, 1 = strongly disagree, 0 = indecisive).

The scale was evaluated by reliability analysis for internal consistency and the Cronbach alpha coefficient was calculated (7,8). The scale was evaluated in terms of additivity with Tukey's test of additivity, and the comparisons between groups were made over total scale scores (8).

Since the 14 items of the scale showed additivity according to Tukey's test of additivity ($P = 0.148$), the scores of the items constituting the scale were added up.

Because the scale consisted of 14 items and the highest score of each item was 4, the maximum score that could be obtained from the scale was calculated as 56. Since it would be easier to interpret scores over a total score of 100, the score obtained by each specialist was multiplied by the ratio of 100/56 and was evaluated over a total score of 100 to calculate the specialist perception scores (100 = the score that represents the most positive perception).

2.4. Statistical methods

Since a normal distribution condition was not provided by the Kolmogorov–Smirnov normality test, the Mann–Whitney U test was used in the comparisons between groups in terms of the scale scores used in the study. The scale scores were shown with median and interquartile range. A chi-square test was used in the comparisons between the groups for categorical variables. The odds ratio was calculated by taking JSs as a reference for the duration of specialty, and surgeons and physicians in the field of specialty. Categorical variables were shown as numbers and percentages. P-values below 0.05 were considered statistically significant. The calculations were made with IBM SPSS Statistics 20 (IBM Corp., USA) software.

2.5. Ethical approval

This study was planned as a multicenter prospective study. The study was approved by the Medical Ethics Board of Abant İzzet Baysal University (2011/B.30.2.ABU.0.20.05.04-050.01.0468). All participants were verbally informed before completing the questionnaires.

3. Results

3.1. Demographical features

A total of 27 centers accepted the invitation, but two of them did not send any data. Consequently, the study was completed with the participation of 25 centers and 1906 specialists (581 females, 1325 males) from different parts of Turkey. Of the participants, 1271 specialists (67.5%) were JSs, while 611 (32.5%) were SSs. Twenty-four specialists did not state their duration of experience. Of the applicants, 942 (49.4%) were physicians and 964 (50.6%) were surgeons. The average work-related experience of the specialists in the profession was 10.3 years; 1036 participants (54.4%) were working in university hospitals, 737 (38.5%) in training and research hospitals, 119 (6.2%) in secondary state hospitals, and 14 (0.7%) in private hospitals. Of the participants, 1895 (99.4%) were working in centers with IDSs.

3.2. Results regarding the enforcement of the HAC rules

In total, 77.7% of the participants thought that the HAC rules were necessary, 69.9% that AR policy had a positive effect on the budget, and 63.3% that the HAC reduced the unnecessary use of antibiotics. In addition, 19.7% of the specialists thought that the choice of antibiotics after the AR policy was more consistent with the guidelines compared to the pre-AR period. The great majority (79.1%) of the participants assumed that IDS consultation augmented the antibiotic usage quality. A total of 49.2% of the participants felt that IDS approval results in delayed initiation of antibiotic treatment. When they were obliged to prescribe an antibiotic subjected to the restriction, 14.4% of the specialists prescribed an unrestricted antibiotic, while 83.8% asked for an IDS consultation in such a situation. Participant answers are summarized in Figure 1.

SSs thought that their antibiotics knowledge was better compared to JSs ($P < 0.05$). Similarly, the number of surgeons thinking that they had sufficient knowledge on antibiotics was higher than the physicians ($P < 0.05$). The opinion that excessive antibiotic usage increased with IDS consultation was 33.8% among surgeons and 28.5% among physicians ($P < 0.05$). The distribution of the answers according to professional experience is shown in Figure 2 and according to branches in Figure 3.

The internal reliability coefficient (Cronbach alpha) of the SSPRAR was calculated as 0.835. Item–total correlations were between 0.265 and 0.568. Accordingly, there was a moderately significant relation between the items and the total scale. Therefore, the SSPRAR was considered a reliable scale.

In general, the SSPRAR is a valid, reliable test with high differential power that can be used in the evaluation of non-IDSs' perception regarding AR policy. A significant difference was found in terms of the SSPRAR between total scores according to branches and professional experience (respectively $P < 0.001$ and $P < 0.05$) (Table).

4. Discussion

There is a limited number of studies regarding AR rules for specialists in Turkey. To our knowledge, this study is the first to explore the impact of nationwide AR through the participation of different centers. The results of this study showed that 78% of the non-IDS participants thought that AR policy was necessary. Most non-IDS participants also supported such a restriction. The main reason for this may be the increasing rates of antibiotic resistance in bacteria. Although non-IDSs think that this restriction is a limitation of their practice, they are also aware of the risk presented by antibiotic-resistant bacteria. Therefore, they are willing to accept the idea that antibiotics, and especially broad-spectrum antibiotics, should only be prescribed by specialists in this area (9).

This study, which was conducted years after the initiation of the implementation of AR policy, showed that restricted specialists supported the transfer of this responsibility. Moreover, 69% of the participants thought that IDS-approved AR had reduced the cost of antibiotic-

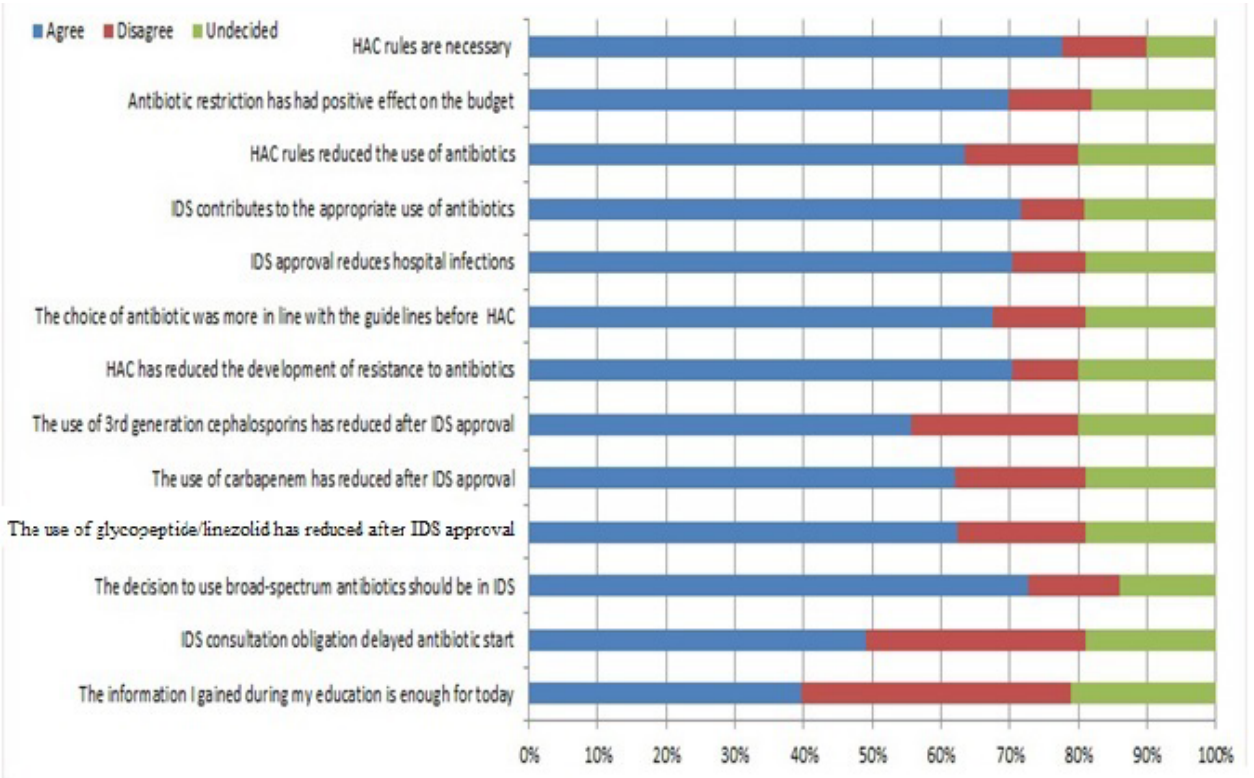

Figure 1. The views of noninfectious disease specialists on antibiotic restriction.

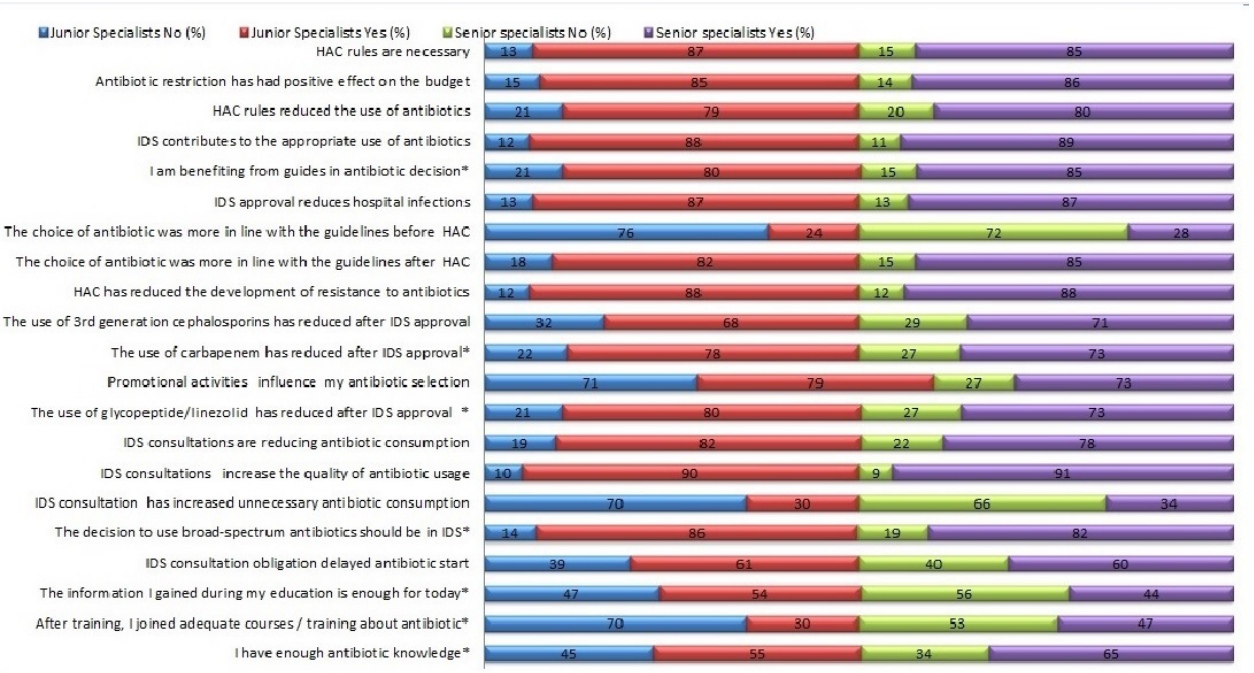

Figure 2. The views of specialists on budget application direction and the mandatory infectious disease and clinical microbiology specialist approval for certain antibiotics, according to their duration of experience in the area of specialty.

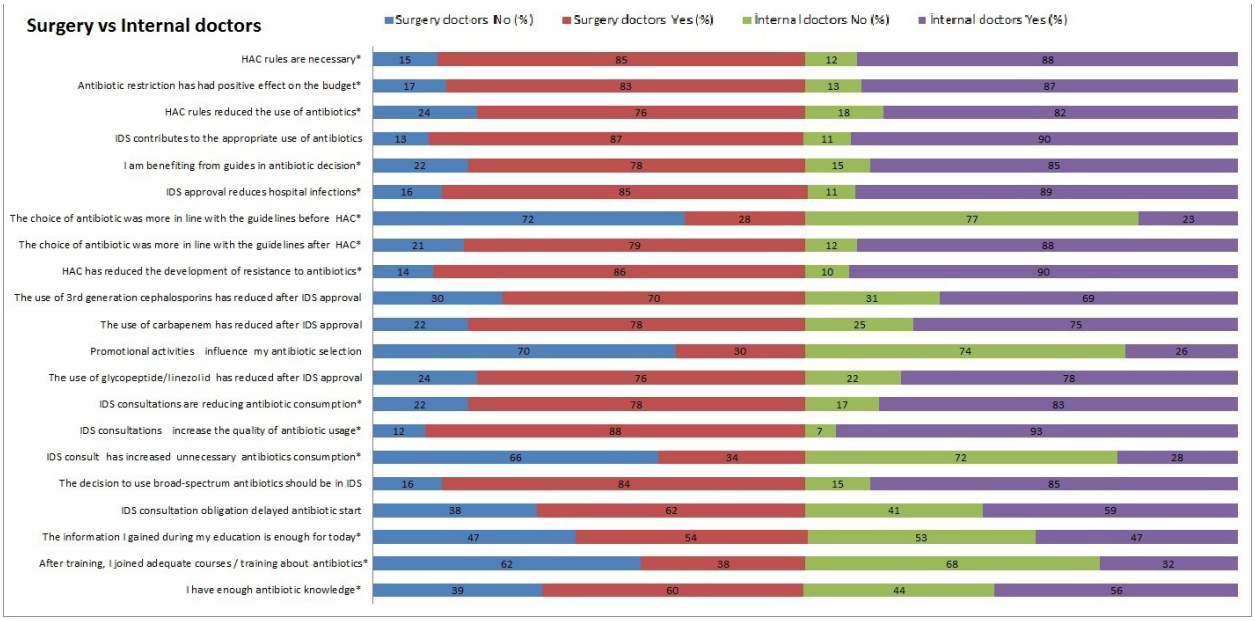

Figure 3. The distribution of the specialists' replies to the queries in the survey according to surgical and medical science branches.

Table. The results of the restriction according to the Scale of Physicians' Perception Regarding Antibiotic Restriction (SSPRAR).

Parameters		N (%)	SSPRAR total score		P-value
			Median [IQR]	Min–max	
Specialty	Internal medicine	942 (49.4)	69.64 [53.57–83.93]	20–100	<0.001
	Surgical	964 (50.6)	66.07 [50.00–80.36]	00–100	
Sex	Female	581 (30.5)	67.86 [50.00–83.93]	5.36–100	0.928
	Male	1325 (69.5)	67.86 [51.79–82.14]	20–100	
Experience	Junior physicians	1271 (67.5)	66.07 [50.00–82.14]	0–100	<0.05
	Senior physicians	611 (32.5)	69.64 [53.57–83.93]	0–100	

related therapy and 63% thought that this approach reduced antibiotic consumption. All these data also confirm that non-IDSs support this policy.

According to the SSPRAR used in this study, SSs had a more favorable attitude towards the AR policy, whereas the perception that the restriction was unnecessary was more common among JSs, which may be attributed to their unawareness of the resistance threat. We feel that they would be more cooperative and would not see the restriction as a limitation of their antibiotic prescription freedom if they were better informed about and aware of this threat (10).

According to the SSPRAR, the negative perception of the AR policy among surgeons was much higher than among physicians. Furthermore, the need for current guidelines for prescription of antibiotics was significantly higher among physicians than among surgeons (85% versus 78%, $P < 0.05$). This may be attributed to the surgeons' antibiotic-prescribing habits (11). In addition, SSs refer to guidelines more often while prescribing antibiotics, whereas JSs need less reference to guidelines (85.3% versus 79.5%, $P < 0.05$). However, SSs think that their knowledge on antibiotics is sufficient, while JSs find it insufficient. The reason why experienced specialists consider their knowledge on antibiotics sufficient might be due to the fact that they refer to guidelines more often. In addition, the fact that JSs refer to the guidelines less frequently might be related to the fact that they have developed the habit of transferring the decision of prescribing broad-spectrum antibiotics to IDS consultations. Another reason might

be the idea that SSs are familiar with the effects and side effects of antibiotics, since they were freely prescribing antibiotics for years. As far as prescribing antibiotics after IDS consultations is concerned, JSs might not be interested in learning more about the subject (6).

The opinion that IDS consultations increase the prescription of unnecessary and broad-spectrum antibiotics was held more often by surgeons than physicians (33.8% versus 28.3%, $P < 0.05$). This might be related to the lack of communication between IDSs and surgeons, the surgeons' antibiotic-prescribing habits, and the surgical infections associated with this application. In addition, while the majority of bacteria were sensitive to many antibiotics in the early 2000s, antibiotic resistance rates of bacteria known to cause hospital infections are very high nowadays (12).

In total, 49.2% of the participants thought that the AR policy requiring IDS approval delayed the initiation of antibiotic treatment. Moreover, there was no difference between surgeons and physicians or between JSs and SSs in this respect. Consultations in hospitals require several procedures, and sometimes it may take 1–6 h to conclude a consultation in busy hospitals (6). In serious conditions such as sepsis, the delayed initiation of antibiotic treatment due to prolonged consultation times may risk the life of the patient (13). Therefore, IDSs should attend the consultations as quickly as possible, especially in cases of patients with infectious emergencies (14).

Our study has some limitations. First, we asked clinicians who assumed that the AR policy is rational and reasonable and who had good relations with the IDS to participate in the study, leading to a bias in the selection of study participants. Second, the number of specialists working in secondary state hospitals and in private hospitals who participated in our survey was smaller than the number of the participants who were working in tertiary-care hospitals. Thus, we might not have been able to accurately compare the views of specialists in secondary- and tertiary-care hospitals on AR policy.

In conclusion, the restricted usage of antibiotics is favored by four-fifths of non-IDSs who agree that this approach reduces costs. Physicians support this restriction more so than surgeons. However, it is important to note that the AR policy requiring the IDSs' approval is perceived to delay the initiation of antibiotic treatment. Hence, there is a need for new policies that will increase the cooperation between IDSs and other branch specialists and that will encourage the rational usage of antibiotics.

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