A report of antibiotic restriction policy in Ghaem university hospital, Mashhad, Northea

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ABSTRACT

Aim: The most serious problem in health care setting is over use and misuse antibiotics particularly in Iran. In 2017, some programs were implemented by the Iranian Ministry of Health (MOH) to controlling the antibacterial agent consumption in hospitals. This study evaluates the impact of implementation a restriction policy in Ghaem university hospital, which tries to limit the prescription of eight expensive antibiotics.

Method: According to this policy the prescription of these antibiotics were only allowed by infectious disease specialists. The restriction policy of expensive antibiotics were initiated from April 21, 2018. We compared the consumption of these eight expensive antibiotics during 2 trimesters before and after the administration of this restriction policy. We also measured these drugs usage during the same period in previous year (April 21– July 22, 2017).

Results: The consumption was decreased 37.7% during trimester after the starting of restriction plan compare to similar period before it ($p = 0$). The consumption had also declined compare to the same period in previous year.

Conclusions: This simple restriction policy was effective in decreasing the antibiotic usage in Ghaem university hospital.

1. Introduction

In 20 century, Antibiotics revolutionized the treatment of infections and enhanced the public health by reduction of morbidity and the mortality.¹ The antibiotic consumption had coincided with the evolution of resistance among nosocomial and community-acquired infections. Antimicrobial resistance is a mounting concern for health system all around the world.² based on evidence, there is strong correlation between antibiotic over use, hospital costs, reduction of sensitive gut flora and the emergence and dissemination of resistant bacteria strains.^{3,4} In American and European university hospital settings, antibiotics were prescribed in 60–90% of cases, more often there was no laboratory confirmation and no indication of antibiotic therapy in 40% of these cases.^{5,6}

In Iran, over use of antibiotics has been reached critical levels

demand on unnecessary prescription, therefore the average consumption of antibiotics is 2–4 times more than USA and Europe. Also the higher frequency of antibiotics misuse was found in surgical department compare with internal medicine unit, which have been utilized as prophylactic.^{5,7} Misuse and over-prescription of antibiotics was spending a large portion of Iran's budget, which is treating the community health, increasing cost of patients and health-care setting.^{8,9}

The antibiotic restriction policies can significantly reduce antibiotic consumption and health care cost.^{10,11} A systematic programs should be designed to optimize antibiotic use clinical outcome, provide effective antimicrobial therapy in order to limit the emergence of antimicrobial-resistant bacteria and related adverse effects.¹² Approximately 60% of all American patients were prescribed an antibacterial drug during hospitalization, about 50% of this was unnecessary or otherwise inappropriate. In our country, this rate is higher more than 2

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to 4 times.^{6,12} Several strategies for antimicrobial stewardship have been suggested, such as educational efforts of healthcare providers, formulary restriction and review, antibiotic order forms, feedback activities, and approval requirement from an infection disease specialist for drug prescription.¹³

From 2018, the Iranian Ministry of Health made an effort to develop an antimicrobial restriction policy which reduce the antibiotic usage and economic cost. Based on this policy, administration of the eight expensive antibiotics were restricted without approval by an infectious disease specialist or internist (The number of letter: 31,991). The purpose of this study is how this policy could be effective on eight expensive antibiotics usage during three month before and after program, also compare to same period in previous year in Ghaem hospital of Mashhad.

2. Material and method

Our retrospective cross-sectional study was conducted in the Ghaem university hospital in all the wards (both medical and surgical, including pediatrics and obstetrics wards). This hospital is a third level hospital in northeast region of Iran. Approximately 43,000 patients were admitted annually, with a total capacity of 900 beds. This study was evaluated the effect of controlling the prescription of Carbapenems (Imipenem and Meropenem), Voriconazole, Vancomycin, Amphotericin B, Colistin, Linezolid, Ticoplanin and Caspofungin. This policy only allowed infectious specialists to prescribe these antibiotics. We analyzed the antibiotics consumption during 3 months before and after the administration of this policy. We also measured consumption during the same period in previous year. The antibiotic consumption is estimated in three ways: the total vial consumed, the antibiotics consumed in mg and the antibiotic consumption in mg toward the total hospitalized patients in each period. All statistical analyses were done using SPSS version 16.0. The antibiotics Anatomical Therapeutic Chemical (ATC) codes were extracted from WHO website.

3. Result

During trimester before the restriction plan, 10,148 patients were admitted in Ghaem hospital. The number of hospitalized patients were 12,543 during trimester after the policy started, which were 12,649 for previous year. About 80% of patients received at least one antibiotic dose. The demographic variables of studies were shown in Table 1. The number of patients admitted in trimester after policy implementation was almost the same as last year. The number of patients decreased during the trimester before program, which could be due to the proximity of the New Year holiday.

Among these expensive antibiotics, meropenem was used more frequently in Ghaem hospital which accounted for 2094.68 mg/patients, followed by vancomycin with 1699.31 mg/patients of total consumption in these periods.

The total consumption was decreased from 26877760 mg (2648.55 mg/patients) before the restriction started to 17630280 mg (1405.65 mg/patients) during three month after it. Which means these antibiotics consumption were reduced about 34.4% although low hospitalization were occurred in Ghaem hospital ($p = 0$) (Table 2). Furthermore, the antibiotic consumption in trimester after restriction policy had been

Table 1
Demographic variables of studies.

Variable	After	Before	Previous year
Hospital beds	870	870	850
Number of wards	43	43	41
Number of hospitalization patients	12542	10148	12649
Age (mean)	42	40	45
Male (%)	56	55.2	57.5
Female (%)	44	44.8	42.5

Table 2

Antibiotics consumption before and after restriction Plan.

Drug	ATC code	Total Antibiotics consumed (mg)			Consumption/patients (mg/patient)		
		Last year	before restriction plan	after restriction plan	Last year	before restriction plan	after restriction plan
Imipenem 500	J01DH51	2,307,500	2,746,500	1,627,500	182.42	270.64	129.76
Meropenem	J01DH02	14,690,000	16,612,500	10,359,500	1161.35	1637.02	825.98
Colistin	J01XB01	114,640	94,960	179,880	9.06	9.35	14.34
Vancomycin 500	J01XA01	6,941,500	7,363,000	5,433,000	548.77	725.56	433.18
Caspofungin 50	J02AX04	3,550	50	4,100	0.28	0.0049	0.32
Teicoplanin 400	J01XA02	7,200	46,400	22,800	0.57	4.57	1.80
Amphotericin B 50	J02AA01	0	14,350	3,500	0	1.41	0.27
Total		24,064,390	26,877,760	17,630,280	1902.45	2648.55	1405.65

reduced about 24,064,390 mg (1902.45 mg/patients) comparing to the same period in the previous year, (26.1%). The most prominent reduction of antibiotics usage was observed for imipenem, which had been decreased from 182.42 mg/patient to 129.76 mg/patient during previous year compare to restriction plan started. In the next step, the consumption of meropenem were reduced from 1161.35 mg/patient to 825.98 mg/patient and, reduction in vancomycin usage were reported from 548.77 mg/patient to 433.18 mg/patient during previous year compare to restriction plan started. Unfortunately, voriconazole was not available for prescriptions during our study.

4. Discussion

Our local program have emphasized on monitoring compliance with antibiotic prescriptions and reduced consumption which would optimize the quality of treatment. Our results indicated that most of these expensive antibiotic usage decreased during this restriction period following by approval specialist. Assessing the hospital antibiotics usage during 2 trimesters before and after implantation policy indicated that antibiotics consumption has decreased by 34.4% and was 28.1% compared to the previous year. Contrary to the above results, some of these antibiotics consumption such as caspofungin, colistin have been increased in three month after administration compare with same period in last year, which can be attributed to lack of access due to some sanctions in previous year. The prescribing restriction by infectious disease specialist or internist is provided a fundamental strategy which improve antibiotics consumption. Many Iranian studies have shown the effectiveness of these measures.^{7,13,14}

In Kerman, the use of carbapenems and vancomycin were restricted based on the directive of Health Ministry. This investigation showed the consumption of meropenem and vancomycin were decreased from 72.3% to 49% and 60.9%–37.7%, respectively. However, imipenem consumption was increased from 5% to 8%. The same restriction policy were implemented in Emam Ali hospital of Karaj which narrowed eight expensive antibiotics including colistin, imipenem, meropenem, linezolid, vancomycin, amphotericin B, voriconazole, teicoplanin and caspofungin. The consumption of colistin, caspofungin and amphotericin have been reported to decrease about 63.5% and 15% for imipenem, meropenem and linezolid. The consumption of teicoplanin and voriconazole have increased. In our hospital, meropenem, imipenem and vancomycin were consumed more frequently before administration these policy, which has dramatically decreased after it. The usage of antibiotics highlighted in this policy were decreased while other antibiotics have been reported to increase especially clindamycin which not monitored by this plan.

The measurement of antibiotics consumption in hospitals could estimate and improve overuse of antibiotics and treatment cost consequently.^{15–17} In conclusion, this study showed that the specialist approval and restriction policy reduce the antibiotics consumption effectively. The improvement of antibiotics usage is a major challenge. Therefore it requires education and collaboration of all medical team

members which can consist a fundamental strategy to increase the efficacy of antibiotics usage, which probably decrease costs and antibiotics resistance. According to recent study, the implementation of long-standing restriction policy for all antibiotics is required in every health care system. The effective implementation of these policies were attended by insurances and health ministry.

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Declaration of competing interest

The authors declare that they have no competing interests.

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