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Conclusions: Overall, the samples surveyed after the comm
frequency of antibiotic prescribing and improved knowledge
the samples surveyed before the campaign. Ongoing interve
decrease antibiotic misuse and reduce the spread of antibio

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Background

Antibiotic resistance is a growing public health threat worldwide and a major threat to global health security. Increasing antibiotic resistance is a consequence of selective pressures created by use of antibiotics. Respiratory infections are the leading reason for antibiotic prescriptions in both the adult and pediatric populations. Overuse of antibiotics, such as taking antibiotics when they aren't needed for viral infections, is a driver of antibiotic resistance, which is a serious problem for public health, individual patients, and healthcare systems. Antibiotics are most frequently prescribed for management of acute respiratory tract infections (ARIs), including rhinosinusitis, pharyngitis, bronchitis, otitis media, and nonspecific ARIs [1]. Published data from the pre-intervention study revealed that 82% of pediatric visits for ARIs and 85% of adult visits for ARIs resulted in an antibiotic prescription in Minya District, Egypt. The pre-intervention data found particularly high antibiotic prescribing for infections that do not warrant antibiotics, including 53% prescribing among pediatric common cold visits and 94% prescribing among adult bronchitis visits [2].

Numerous interventions to improve antibiotic prescribing practices have been reported from various coun-

the patient exit interviews in the pre- and post-intervention periods. The same scoring procedures were also used to measure the beliefs and attitudes before and after the intervention.

Sample size calculations were estimated in preparation for the pre-intervention surveys assuming that physicians prescribed antibiotics for 60% of ARI visits and that antibiotic prescribing for ARIs would be reduced by 20% post-intervention, with a significance level of 95% and a power of 90%. The details of the sample size calculations are described elsewhere [2, 13].

Communication campaign intervention

An intensive campaign to promote appropriate antibiotic prescription was launched in Minya District from August to December 2011. The aim of the campaign was to raise the awareness of physicians, pharmacists, and the general public in the district regarding the importance of rational antibiotic prescribing for ARIs. The primary audience included all physician specialties that might be involved with treatment of patients with ARIs (internal medicine, pediatrics, chest, general medicine, ENT, or general practitioners), either in the government or private sector. In addition, pharmacists and their assistants in the public and private sector were also targeted. The campaign targeted all physicians, pharmacists, and the general public in Minya. Random samples of patients from the Minya District were interviewed pre- and post-intervention and physicians and pharmacists were invited to participate in the pre- and post-intervention surveys as described above in order to describe the reach of the campaign throughout the entire district.

A social media campaign targeting educated youth was implemented using Facebook and the YouTube channel. A page named after the campaign slogan “Be wise in using antibiotics” was added on Facebook and YouTube. Three moderators were leading a discussion on appropriate antibiotic use in Arabic. Electronic copies of the informational, educational, and communication materials were uploaded on the Facebook page. Videos produced by CDC’s Get Smart campaign were translated and subtitles were added in Arabic after obtaining CDC approval. These videos were uploaded to the YouTube channel. Animated videos were also produced to act as

indicative of an attitude supportive of proper use of antibiotics, a score of 5 was applied to the response of "strongly agree of

Table 1 Demographic characteristics of study population in pre and post intervention surveys, Minya, 2012

Characteristic	Pre-intervention		Post-intervention	
	N	%	N	%
Adult patients[a] (≥18 years old)	= 113		= 277	
Age in years (mean ± SD)	37.2 ± 16		36.0 ± 17	
Males	42	37.2	111	40.1
Education				
Illiterate	50	44.2	169	61.0
Primary education	22	19.5	39	14.1
Secondary	30	26.5	54	19.5
University	11	9.7	15	5.4
Pediatric patients[a] (< 18 years old)	= 218		= 330	
Age in years (mean ± SD)	4.9 ± 4		4.4 ± 3	
Males	109	50.0	188	57.0
Education				
Illiterate (Parents)	90	41.3	213	64.5
Primary education	48	22.0	39	11.8
Secondary	73	33.5	56	17.0
University	7	3.2	22	6.7
Clinicians	= 237		= 289	
Age in years (mean ± SD)	41.2 ± 11		39.3 ± 11	
Males	134	56.5	131	45.3
Specialty				

Table 2 Antibiotic prescribing frequency for acute respiratory infections according to clinical diagnosis pre- and post-intervention, Minya, 2012

Diagnosis	Pre-intervention			Post-intervention		
	Encounters reviewed	Encounters including antibiotic prescription		Encounters reviewed	Encounters including antibiotic prescription	
	N	N	%	N	N	%
Pediatric						
Ear infection	2	2	100.0	5	3	60.0
Tonsillitis	35	34	97.1	35	34	97.1
Pharyngitis	53	51	96.2	36	30	83.3
Sinusitis	7	6	85.7	14	14	100.0
Bronchitis	78	63	80.8	97	68	70.1
Common cold	43	23	53.5	143	54	37.8
Total pediatric	218	179	82.1	330	203	61.5
Adults						
Ear infection	4	4	100.0	2	1	50.0
Tonsillitis	10	10	100.0	17	17	100.0
Pharyngitis	27	26	96.3	61	55	90.2
Sinusitis	10	8	80.0	10	10	100.0
Bronchitis	35	33	94.3	77	49	63.6
Common cold	27	17	63.0	110	56	50.9
Total adults	113	98	86.7	277	188	67.9
Grand total	331	277	83.7	607	391	64.4

Table 3 Belief and attitude scores regarding the judicious use of antibiotics among physicians and pharmacists pre- and post-intervention[a]

	Physicians		Pharmacists	
	Pre-intervention = 237	Post-intervention = 289	Pre-intervention = 483	Post-intervention = 596
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
Physicians should never prescribe antibiotics when they are unnecessary	4.8 ± 0.7	4.7 ± 0.7	4.5 ± 1.1	4.6 ± 1.0
Too many people are treated with antibiotics when not necessary	3.5 ± 1.5	3.3 ± 1.7	3.7 ± 1.4	3.8 ± 1.5
Overuse of antibiotics can make bacteria more resistant to antibiotics	4.6 ± 0.9	4.7 ± 1.0	3.9 ± 1.7	4.1 ± 1.5
Giving an antibiotic to a patient with cold symptoms can prevent an infection from occurring	3.9 ± 1.4	4.3 ± 1.2	3.5 ± 1.4	3.6 ± 1.6
It is worth trying an antibiotic when someone has cold symptoms for 5 days	3.9 ± 1.2	4.3 ± 1.1	2.8 ± 1.6	3.7 ± 1.5
Using antibiotics frequently doesn't make them less effective	4.5 ± 1.2	4.7 ± 0.9	3.8 ± 1.6	4.4 ± 1.3
Treatment with antibiotics is necessary when nasal discharge turns from yellow to green in color	1.8 ± 1.2	3.2 ± 1.6	1.4 ± 1.2	3.0 ± 1.7
Antibiotics help cold symptoms clear up more quickly	4.3 ± 1.1	4.6 ± 0.9	3.4 ± 1.5	4.1 ± 1.4
Antibiotics are helpful in treating colds	4.2 ± 1.1	4.7 ± 0.7	3.2 ± 1.5	4.0 ± 1.4
Overall scores	3.8 ± 0.5	4.0 ± 0.7	3.3 ± 0.9	4.0 ± 1.2

Table 4 Self-reported antibiotic prescribing practices for ARIs for physicians and pharmacists pre- and post-intervention

Prescribing practice	Physicians				Pharmacists			
	Pre-intervention (= 237)		Post-intervention (= 289)		Pre-intervention (= 483)		Post-intervention (= 596)	
	N	%	N	%	N	%	N	%
Prescribing antibiotics (pharmacists only)								
Prescribe antibiotics					404	83.6	344	57.7
Recommend antibiotics					279	57.8	148	24.8
Prescribing frequency								
Common cold								
Most times	22	9.3	6	2.1	44	9.1	17	2.9
Sometimes	128	54.0	97	33.6	282	58.4	150	25.2
Never	84	35.4	186	64.4	78	16.1	177	29.7
Bronchitis (physicians only)								
Most times	156	65.8	82	28.4				
Sometimes	71	30.0	179	61.9				
Never	6	2.5	25	8.7				
Sinusitis (physicians only)								
Most times	103	43.5	49	17.0				
Sometimes	117	49.4	183	63.3				
Never	12	5.1	52	18.0				

physicians, and pharmacists. In a setting where patients can purchase antibiotics without a physician prescription, this educational intervention aimed to increase awareness about appropriate use not only among physicians and pharmacists, but also among patients who can independently purchase antibiotics over the counter. This study is the first time an educational intervention aimed at improving antibiotic use was implemented and evaluated in Egypt.

The follow-up surveys of patients leaving outpatient visits for ARIs in Minya demonstrated a decrease in antibiotic prescribing after the educational intervention. Comparing survey results before and after the intervention, prescribing decreased in both pediatric and adult visits for ARI symptoms. Although this is the first study of its kind in Egypt, similar studies assessing antibiotic use interventions have been conducted in other countries. Two studies in the United States implementing

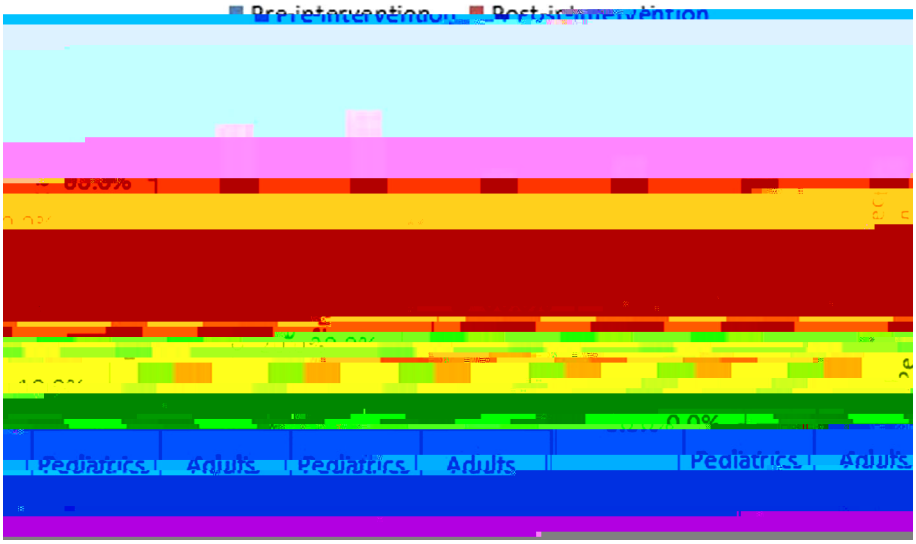

Fig. 1 Physician treatment choices in response to pediatric and adult acute respiratory infection clinical scenarios, pre- and post-intervention

and pharmacists in Minya, physicians and pharmacists were invited to participate in the pre- and post-intervention surveys and random samples of all healthcare clinics in Minya were taken for the patient surveys before and after the intervention. This approach allowed us to describe the pre- and post-intervention prescr

13. Dooling KL, Kandeel A, Hicks LA, El-Shoubary W, Fawzi K, Kandeel Y, Etman