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Pattern of Use, Knowledge, Attitude and Practice of Healthcare Workers about Antibioticsin Egyptian Primary Healthcare Facilities

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Abstract

***Background:** Studies have shown that a relatively large proportion of antibiotic use is inappropriate or unnecessary.*

***Aims:** This study was conducted to assess the pattern of antibiotics use among healthcare workers in primary healthcare facilities as well as to assess their knowledge, attitude and practice towards antibiotics use with exploring its associated factors.*

***Methods:** A cross sectional study with an analytic component was conducted on 218healthcare workers in Mahallat Damanah family health center, Dakahlia governorate, Egypt using a modified self-administered semi-structured questionnaire.*

***Results:** The study showed that the most frequent prescribed antibiotic was amoxicillin. The most frequent source of antibiotics used was pharmacy with prescription (43.1%) followed by pharmacy without prescription (38.5%). The main reasons for antibiotic use without prescription were previous knowledge (37.6%) followed by mild condition (20.2%) and previous experience (17.4%)while the main reasons for not completing the antibiotic course were improvement (38.1%) followed by fear of side effects (25.2%). The total mean score for knowledge, attitude and practice were 11.07±2.58,24.83±3.80 and 5.73±2.22 respectively. It was found that 88.5% of healthcare workers had good knowledge, 47.7% expressed favorable attitude and56.9% showed good practice. Medical staff (OR=5.5) and working experience >5 years (OR=2.6) were predictors of good knowledge. Furthermore, working experience >5 years (OR=4.5) and working hours <42 h (OR=2.9) were predictors of good practice while the only predictor of good attitude was the working experience >5 years (OR=2.1).*

***Conclusions:** The study mainly found that the most common reasons for antibiotic use without prescription were: previous knowledge, mild condition, previous experience, counseling without prescription, costly counseling, easy to buy and others with similar condition. While the reasons for not completing course of antibiotic were improvement, fear of side effects, the antibiotics were forgotten and the antibiotics were kept for future. Also, although the study showed an adequate level of knowledge which resulted in an appropriate practice, the attitude was unfavorable.*

Keywords: *pattern of use; antibiotics; knowledge, attitude and practice; healthcare workers; primary healthcare facilities.*

Introduction

Antibiotic misuse, sometimes called antibiotic abuse, refers to the misuse or overuse of antibiotics, with potentially serious effects on health. For example, antibiotics have no effect on viral infections such as the common cold, bronchitis and sinusitis. They are also ineffective against sore throats, which are usually viral and self-resolving.[1]Studies have shown that a relatively large proportion of antibiotic use is inappropriate or unnecessary.[2]Antibiotic misuse is a contributing factor to the development of antibiotic resistance. Antibiotic resistance is a global public health concern[3]and if antimicrobial resistance continues to increase from current levels, it is estimated by 2050 that ten million people would die every year due to lack of available treatment.[4]The number of infections due to antibiotic-resistant bacteria is growing and outpacing the rate at which new classes of antibiotics are discovered and synthesized.[5] Antimicrobial resistance is also a barrier to public health efforts in the control of infectious diseases. Infections with drug-resistant bacteria have increased not only morbidity and mortality but also duration of hospitalization and cost of treatment as well as the economic burden on families and societies.[6]The burden of both antibiotic resistance and healthcare associated infections is high in all low and middle income countries.[7]In much of the world, antimicrobial drugs are sold without prescription or oversight by health-care professionals. Reviewing 35 community surveys showed that non-prescription use occurred worldwide and accounted for 19–100% of antimicrobial use outside of northern Europe and North America. [4]The effectiveness and easy access to antibiotics result in their overuse and misuse.[8]

About 80% of antibiotic use occurs in the community, with the bulk of it contributed by either primary health care(PHC) providers or self-medication.[9] It is estimated that more than 90% of antibiotics in PHC are prescribed by general practitioners with approximately 70% for respiratory tract infections (RTIs). Primary care physicians are known to adopt defensive medicine approach, prescribing antibiotics to ease fears from diagnostic uncertainty and potential complications as well as patients' ill-founded demands and expectations.[10]

According to the general district of pharmacy in Dakahlia Health Directorate, Egypt in 2018,one of the main drugs supplied to PHC facilities is antibiotics and the cost of antibiotics delivered to PHC facilities represent 30% of the total cost of drugs delivered to these facilities during the same period, thus we will conduct the present study aiming to assess the pattern of antibiotics use among healthcare workers in primary healthcare facilities as well as to assess their knowledge, attitude and practice towards antibiotics use with exploring its associated factors.

Subjects and Methods

Study Locality and Setting

This study was carried out in family health center at Mahallat Damanah which is a district in Dakahlia governorate, Egypt. Family health center in Mahallat Damanah was randomly selected from 5 health centers in Mahallat Damanah district; these centers are: family health center in Mahallat Damanah, rural health office of Mahallat Damanah, family health center in Mansheaa El-Salam, family health center in El-Nasra and family health center in Minit Mahallat Damanah.

Study Design

This is a descriptive cross-sectional study with analytical component.

Study Duration

This study extended from February to April 2019 following the predetermined sample size and sampling technique.

Study Population

The study population wasall healthcare workers of both sexes working in the family health center at Mahallat Damanah. All participants accepted to join the study and filled the questionnaire.

Sample Size

Allhealthcare workers (218 participants) in the family health center at Mahallat Damanah were included in the study: 16 physicians, 22 dentists, 41 pharmacists, 13 sanitarians, 56 nurses and 70 technicians.

Study Tools

Data was collected using a modified self-administered semi-structured questionnaire which was adapted from.[11]The content validity of the questionnaire was insured by consulting panel of experts and amended according to their comments. The questionnaire was

first developed in English and then was translated into Arabic by forward and backward translation method. Finally the Arabic version of the questionnaire was pilot tested on a group of healthcare workers (they were excluded from the full-scale study) to test any difficulties in questionnaire that needed modifications. It was also help in estimating time required for filling the questionnaire and to explore the site of study and the system of work. Some questions were omitted to decrease redundancy in questions, and others were modified to be more applicable. The reliability of the tool was estimated through Cronbach's alpha to be 0.86 which is scientifically accepted.

The questionnaire was composed of 3 parts; part 1 elicited the socio-demographic and work characteristics of the studied group. Part 2 inquired pattern of antibiotic use including type, frequency of use, source of use, cause of use without prescription, cause of incomplete course during the past year. Part 3 assessed Knowledge, attitude and practice of healthcare workers towards antibiotics use. Knowledge questionnaire included 16 statements used to assess the participants' knowledge with correct answer coded as 1 and incorrect answer coded as 0. The attitudes questionnaire included 10 statements used to assess the participants' attitude whereas the response had "agree=1" and "disagree=0" options. The practice questionnaire included 9 statements used to assess the participants' practice with the response had "agree=1", and "disagree=0" options.

Statistical Analysis

The collected data were coded, processed and analyzed using the SPSS program(version 22). Continuous variables were presented as mean and standard deviation (SD).Categorical data were presented as number and percentages. Significance of the results was judged at p-value <0.05. Student t-test was used for testing significance of quantitative data. Chi square and Monte Carlo tests were used to test the significance of categorical data. Significant variables on univariate analysis entered into Logistic regression model using the Forward Wald statistical technique to predict the most significant determinants and to control for possible interactions and confounding effects. Adjusted odds ratios (AOR) and their 95% confidence interval (CI) were calculated.

Results

The socio-demographic characteristics of the studied healthcare workers showed that most of them were: aged less than 40 years (63.3%), females (73.4%), from rural residence (76%) and married (70.2%), with more than half (58.7%) had insufficient income. Occupation of the studied healthcare workers showed that 7.3% were physicians, 10.1% were dentists, 18.8% were pharmacists, 6% were sanitarian, 25.7% were nurses and 32.1% were technicians. In this study, **work characteristics** of the studied healthcare workers showed that most of them had 10 years or more working experience (51.4%) and worked 36 hours per week (58.3%) with 56.4% had morning shift only (data are not shown in table).

Table (1) shows pattern of antibiotics use among the studied healthcare workers. The most frequent type of antibiotic used was amoxicillin (55%), followed by ceftriaxone (27.1%) and erythromycin (23.9%) then ciprofloxacin(23.4%). Frequency of antibiotic use was: once (16.5%), twice (29.8%), three times (19.7%) and more than three times (33.9%). The table showed that the most frequent source of antibiotics used was pharmacy with prescription (43.1%) followed by pharmacy without prescription (38.5%). The data revealed that the most frequent reason for antibiotic use without prescription was the previous knowledge (37.6%) followed by mild condition (20.2%). The participants reported that the commonest reason for incomplete course of antibiotic was the improvement (38.1%) followed by fear of side effects (25.2%).

Regarding knowledge, the results found that 70.6% of participants had incorrect knowledge tha tantibiotics decrease skin infection. In this study, the highest correct answer among the knowledge questions was 90.8% representing respondents who considered antibiotics that causes allergy. The highest incorrect answer among the knowledge questions was 79.8% representing respondents who considered the broad-spectrum antibiotics effect. The results showed that 36.7% had incorrect knowledge about the effectiveness of antibiotics in treatment of viral infections. Also,68.8%of healthcare workers had correct knowledge about the role of antibiotics in pain. Furthermore, 79.8% knew that unnecessary use of antibiotics could lead to antimicrobial resistance. The results found that 54.1%of participants were knowledgeable about the resistance transmission (data are not shown in table).

Table 1. *Pattern of antibiotics useamong the studied healthcare workers: type, frequency of use, source of use, reasons of use without prescription,reasons for incomplete course*

	Study group (n=218)	
	No	%
Typeof used antibiotics:		
-Amoxicillin	120	55.0
- Ceftriaxone	59	27.1
- Erythromycin	52	23.9
- Ciprofloxacin	51	23.4
- Metronidazole	43	19.7
- Ampicillin	42	19.3
- Cotrimoxazole	18	8.3
- Gentamicin	15	6.9
- Chloramphenicol	14	6.4
- Doxycycline	7	3.2
- Cloxacillin	6	2.8
- Benzyl.penicillin	5	2.3
Frequency of use:		
- Once	36	16.5
- Twice	65	29.8
- 3 times	43	19.7
- >3 times	74	33.9
Source of use:		
- Pharmacy with prescription	94	43.1
- Pharmacy without prescription	84	38.5
- Residual	20	9.2
- Others	20	9.2
Reasons of use without prescription:		
- Previous knowledge	82	37.6
- Mild condition	44	20.2
- Previous experience	38	17.4
- Counseling without prescription	19	8.7
- Costly counseling	15	6.9
- Easy to buy	12	5.5
- Others with similar condition	8	3.7
Reasons for incomplete course:		
- Improvement	83	38.1
- Fear of side effects	55	25.2
- Forgot the antibiotic	47	21.6
- Kept the antibiotic for future	33	15.1

Regarding attitude, the result showed that 62.8% of participants believed that the higher cost antibiotic are better and 57.3% believed that antibiotics cure cold. Also, 80.7% had favorable attitude towards stop treatment. The result found that 76.1% of participants had favorable attitude towards asking for antibiotics prescription(data are not shown in table).

Regarding practice, the result revealed that 56% of healthcare workers showed poor practice towards buying antibiotic without prescription. Also, 63.8% of respondents had good practice usage and storage as

well as, 29.4% had good practice about antibiotic for cold. In addition, 54.1% of the studied group had poor practice about preferring broad spectrum antibiotics and 29.4% had bad practice about preferring intra venous antibiotics (data are not shown in table).

Table (2) shows that the total mean score for knowledge was 11.07±2.58 and 88.5% of the studied healthcare workers were considered to be with good knowledge. The total mean score for attitude was 24.83±3.80 and 47.7% of participants were considered to be with favorable attitude. The total mean score for practice was 5.73±2.22 and 56.9% of healthcare workers were considered to be with good practice.

The data revealed statistically significant positive correlation between knowledge score and attitude score (p <0.001) as well as there was significant positive correlation between knowledge score and practice score (p <0.001). Increase knowledge score was associated with increased practice and attitude score(data are not shown in table).

Table2. *Knowledge, attitude and practice of the studied healthcare workers about antibiotics*

Knowledge, attitude & practice	Study group (n=218)
Knowledge score (Mean ± SD) - Good knowledge - Poor knowledge	**11.07±2.58** 193 (88.5 %) 25 (11.5%)
Attitude score (Mean ± SD) - Favorable attitude - Unfavorable attitude	**24.83±3.80** 104 (47.7%) 114 (52.3%)
Practice score (Mean ± SD) - Good practice - Poor practice	**5.73±2.22** 124 (56.9%) 94 (43.1%)

Table (3) shows that knowledge had statistically significant association with age (p =0.022), occupation (p=≤0.001) and working experience (p =0.021) whereas, good knowledge was higher among those with older age >40 years, among those with working experience >5 years and among medical team. On the other hand, knowledge had no statistically significant relation with gender, residence, marital status, income, working hours and shifts.

Table3. *Distribution of knowledge about antibiotics by socio demographic and work characteristics*

Socio demographic and work characteristics	Total	Good knowledge (n=193)		Poor knowledge (n=25)		p-value	UOR (95%CI)
		No	%	No	%		
Age in years: - ≤40 y (r) - >40 y	 138 80	 117 76	 84.8 95.0	 21 4	 15.2 5.0	 0.022*	 3.4 (1.1-10.3)
Gender: - Male (r) - Female	 58 160	 51 142	 87.9 88.8	 7 18	 12.1 11.2	 0.86	 1.1 (0.4-2.7)
Residence: - Rural (r) - Urban	 146 72	 129 64	 88.4 88.9	 17 8	 11.6 11.1	 0.91	 1.1 (0.4-2.6)
Marital status: - Single - Married (r)	 65 153	 58 135	 89.2 88.2	 7 18	 10.8 11.8	 0.83	 1.1 (0.4-2.8)

Income:							
- Sufficient	90	80	88.9	10	11.1	0.88	1.1 (0.5-2.5)
- Not sufficient (r)	128	113	88.3	15	11.7		
Occupation:							
- Medical	135	129	95.6	6	4.4	≤0.001*	5.5 (2.1-14.7)
- Paramedical (r)	83	66	79.5	17	20.5		
Working Experience:							
- ≤5 years (r)	62	50	80.6	12	19.4		
- >5 years	156	143	91.7	13	8.3	0.021*	2.6 (1.1-6.2)
Working hours:							
- <42 h (r)	170	148	87.1	22	12.9		
- ≥42 h	48	45	93.8	3	6.2	0.19	2.2 (0.6-7.8)
Shifts:							
- Morning only (r)	123	106	86.2	17	13.8		
- Morning & night	95	87	91.6	8	8.4	0.21	1.7 (0.7-4.2)

***:** *statistically significant* **r:** *reference group* ***UOR:** unadjusted odds ratio* ***CI:** confidence interval*

Table (4) shows that attitude had statistically significant association with age (p=0.006) and working experience (p=0.044) whereas, favorable attitude was higher among age group >40 years and among those with working experience >5 years. However, there was no statistically significant relation between attitude and other factors.

Table4. *Distribution of attitude towards antibiotics by socio demographic and work characteristics*

Socio demographic and work characteristics	Total	Favorable attitude (n=104)		unfavorable attitude (n=114)		p-value	UOR (95%CI)
		No	%	No	%		
Age in years:							
- ≤40 y (r)	138	56	40.6	82	59.4		
- >40 y	80	48	60.0	32	40.0	0.006*	2.2 (1.2-3.8)
Gender:							
- Male (r)	58	27	46.6	77	48.1		
- Female	160	31	53.4	83	51.9	0.83	1.1 (0.6-1.9)
Residence:							
- Rural (r)	146	68	46.6	78	53.4		
- Urban	72	36	50.0	36	50.0	0.63	1.1 (0.6-2.1)
Marital status:							
- Single (r)	65	26	40.0	39	60.0		
- Married	153	78	51.0	75	49.0	0.14	1.5 (0.8-2.8)
Income:							
- Sufficient	90	37	41.1	67	52.3	0.10	1.1 (0.4-1.1)
- Not sufficient (r)	128	53	58.9	61	47.7		
Occupation:							
- Medical	135	70	51.9	65	48.4	0.12	1.6 (0.9-2.7)
- Paramedical (r)	83	34	41.0	49	59.0		
Experience:							
- ≤5 years (r)	62	19	30.6	43	69.4		
- >5 years	156	71	45.5	85	54.5	0.044*	1.9 (1.1-3.5)

Working hours:							
- <42 h (r)	170	81	47.6	89	52.4		
- ≥42 h	48	23	47.9	25	52.1	0.97	1.01 (0.5-1.9)
Shifts:							
- Morning only (r)	123	53	43.1	70	56.9		
- Morning & night	95	51	53.7	44	46.3	0.12	1.5 (0.9-2.6)

***:** *statistically significant* **r:** *reference group* ***UOR:** unadjusted odds ratio* ***CI:** confidence interval*

Table (5) shows that practice had statistically significant association with age (p=0.016), working experience (p=≤0.001) and working hours (p=0.038).Good practice was higher in age group >40 years, among those with working experience >5 years and among group with working hours<42 h. The table showed that there was no statistically significant relation between practice and gender, residence, marital status, income, occupation and shifts.

Table5. *Distribution of practice towards antibiotics by socio demographic and work characteristics*

Socio demographic and work characteristics	Total	Good practice (n=124)		Poor practice (n=94)		p value	UOR (95%CI)
		No	%	No	%		
Age in years:							
- ≤40 y (r)	138	70	50.7	68	49.3		
- >40 y	80	54	67.5	26	32.5	0.016*	2.01 (1.1-3.6)
Gender:							
- Male (r)	58	31	53.4	27	46.6		
- Female	160	93	58.1	67	41.9	0.54	1.2 (0.6-2.2)
Residence:							
- Rural	146	87	59.6	59	40.4	0.25	1.4 (0.8-2.4)
- Urban (r)	72	37	51.4	35	48.6		
Marital status:							
- Single (r)	65	36	55.4	29	44.6		
- Married	153	88	57.5	65	42.5	0.77	1.1 (0.6-1.9)
Income:							
- Sufficient	90	50	55.6	40	44.4	0.74	0.9 (0.5-1.5)
- Not sufficient (r)	128	74	57.8	54	42.2		
Occupation:							
- Medical	135	83	61.5	52	38.5	0.08	1.6 (0.9-2.8)
- Paramedical (r)	83	41	49.4	42	50.6		
Experience:							
- ≤5 years (r)	62	21	33.9	41	66.1		
- >5 years	156	103	66.0	53	34.0	≤0.001*	3.8 (2-7.1)
Working hours:							
- <42 h	170	103	60.6	67	39.4	0.038*	1.9 (1.03-3.8)
- ≥42 h (r)	48	21	43.8	27	56.2		
Shifts:							
- Morning only (r)	123	63	51.2	60	48.8		
- Morning & night	95	61	64.2	34	35.8	0.055	1.7 (0.9-2.9)

***:** *statistically significant* **r:** *reference group* ***UOR:** unadjusted odds ratio* ***CI:** confidence interval*

Table (6) shows that after logistic regression analysis and adjusting the confounding factors, the following were the significant independent predictors of good knowledge: medical staff (OR=5.5) and working experience >5 years (OR=2.6). The table shows also that the only significant independent predictor of good attitude was the working experience >5 years (OR=2.1). Furthermore, the data revealed that the significant independent predictors of good practice were working experience >5 years (OR=4.5) and working hours <42 h (OR=2.9).

Table6. *Logistic regression analysis of independent predictors of good knowledge, attitude and practice of the studied healthcare workers towards antibiotics*

Independent predictor	β	P-value	AOR (95%CI)
Good knowledge:			
Occupation - Medical - Paramedical (r)	1.71	≤0.001*	5.5 (2.08-14)
Working experience - ≤5 years (r) - >5 years	0.971	0.025*	2.6 (1.1-6.2)
Good attitude:			
Working experience - ≤5 years (r) - >5 years	0.768	0.03*	2.1 (1.08-4.3)
Goodpractice:			
Working experience - ≤5 years (r) - >5 years	1.50	≤0.001*	4.5 (2.2-9.3)
Working hours - <42 h - ≥42 h (r)	1.07	0.003*	2.9 (1.5-5.9)
Constant Modelχ^2 % correctly predicted P-value	1.35 13.68 89.4% ≤0.001		

***:** statistically significant.* **r:** *reference group* ***AOR:** adjusted odds ratio* ***CI:** confidence interval*

Discussion

Antibiotics are the most frequently prescribed drugs, but they are often misused.[12] This contributes to the spreading of resistant strains of bacteria.[13] One of the causes for the antimicrobial misuse is linked to a wrong prescribing behavior amongst physicians.[14] The WHO has highlighted the irrational use of antimicrobials as public health issue coupled with inadequate measures to control infections. Even WHO set the theme of World Health Day as 'Combat Antimicrobial Resistance: No Action Today, No Cure Tomorrow.[15, 16]

The current study aimed to assess the pattern of antibiotic use among healthcare workers in addition to evaluation of their knowledge, attitude and practice towards these antibiotics in Mehalet-Damana family health center, Dakahlia governorate, Egypt.

In this study, the most frequent antibiotic prescribed was amoxicillin (55.0%) followed by ceftriaxone (27.1%) and erythromycin (23.9%). This agreed with other studies in which the most prescribed antibiotic was also amoxicillin.[3, 17, 18]However in contrast to our study, the Chem et al study found that the most frequent prescribed antibiotics that followed the amoxicillin were cotrimoxazole and metronidazole[3]

while in Yimenu et al, these were ciprofloxacin and metronidazole.[18]This high frequency of use of amoxicillin may be due to the perception that this antibioticis effective against extended-spectrum β-lactamase-producing Gram-negative bacteria that are endemic in the country.[19]

The presen twork showed that the frequency of antibiotic use were once (16.5%), twice (29.8%), three times (19.7%) and more than three times (33.9%). This results were more or less similar to Jordanian study conducted by Suaifan et al.[20]

In our study, the source of antibiotics used were: pharmacy with prescription (43.1%), pharmacy without prescription (38.5%), residual and others (9.2% for each). However, in Jordanian study carried out by Suaifan et al; 52.7% of participant purchased antibiotic from retail pharmacies using a clinician's prescription and 27.7% purchased them from pharmacies without a prescription while 13.2% used left-over antibiotics, and 5.3% got them from other sources such as friends.[20]

The present study revealed that reasons for antibiotic use without prescription were previous knowledge (37.6%), mild condition (20.2%), previous experience (17.4%), counseling without prescription (8.7%), costly counseling (6.9%), easy to buy (5.5%) and others with similar condition (3.7%). In contrast to our finding, Elong Ekambiet al study found that the main personal motivating for antibiotic self-medication was the recidivism/recurrent of disease symptoms that had been treated before and for which the person had already received a prescription (33.9%) and drug taking practice (25.4%) or renewal of previous prescription (23.7%).[21] The main reasons given for the practice of self-medication without prescriptionin developing countries include proximity of pharmacies to their residence or long distance to healthcare facility, lack of money, ignorance, mild/minor illness, poor attitude of health workers (rude, corrupt, dirty) re-treatment of similar illness and lack of health personnel.[22]

Our results showed that the reasons for not completing course of antibiotic as reported by the studied health workers: 38.1% were improved, 25.2% had fear of side effects, 21.6% forgot the antibiotic and 15.1% kept the antibiotic for future. In Comparison to our reasons, the study of Chan et al showed that the reasons mentioned by their participants for not complete the course of antibiotics were 66.3% deemed it unnecessary to complete the course, 15.7% stopped the course because of adverse effects, and 7.2% reported no clear instructions from their physicians on the need for completion.[23]

Regarding knowledge of the studied healthcare workers about antibiotics use, the study showed that although their knowledge was generally good (88.5% of participants with good knowledge), some findings demonstrated that participants had poor knowledge pertaining to that antibiotics decrease skin infection as 70.6% had incorrect knowledge about this issue. In this study, the highest correct answer among the knowledge questions was 90.8% representing respondents who considered antibiotics that causes allergy. On the other hand, the highest incorrect answer among the knowledge questions was 79.8% representing respondents who considered the broad-spectrum antibiotics effect. The current results showed that more than third (36.7%) of the studied healthcare workers in this study had incorrect knowledge about the effectiveness of antibiotics in treatment of viral infections which in comparison, is less than results of other surveys conducted in Malaysia[24], in New Jersey[25]and in Saudi Arabia[26]. The present work also showed that more than half of healthcare workers (68.8%) had correct knowledge about the role of antibiotics in pain which was much more than the result of Elong Ekambi et al study in which10.6% of participants knew the role of antibiotics in calming the pain.[21] Furthermore, the present work showed that most of participants (79.8%) knew that unnecessary use of antibiotics could lead to antimicrobial resistance. This finding was slightly higher than that of Jordanian[27], Namibian[28]andEthiopian[29] studies. In addition, our results found that nearly half (54.1%) of participants were knowledgeable about the resistance transmission which was less than the frequency (86.9%) reported by other study.[30]

Regarding attitude, this study showed that nearly half of the studied healthcare workers (47.7%) expressed favorable attitude towards antibiotics use. The result showed that 62.8% of participants believed that the higher cost antibiotic are better, and this result was consistent with a study conducted by El-Sherbiny et al in which 55.7% believed that newer/more expensive antibiotics would give a better effect.[31]

The current study revealed that 57.3% of participants believed that antibiotics cure cold. In comparison, a study carried out by Padmanabha et al showed that 42.03% of participants reported that antibiotics should be taken on developing a cold to avoid serious illness and 57.24% of them believed that taking antibiotics on having a cold/fever made them feel better more quickly.[32]Other study revealed that 54.4% of participants agreed on the ability of antibiotics to speed up the recovery from most coughs and colds.[33] Our study revealed that 80.7% of participants had a favorable attitude towards stop treatment which is higher than result in Lv et al study which reported nearly half of the participants incorrectly thought that they could stop treatment as soon as their symptoms had disappeared.[11] Moreover, the majority of our health workers believed that there was current irrational use of antibiotics, that was the main cause of bacterial resistance and that it affected their family's health with 67.9% of them had a favorable attitude about that. These results are in line with other studies.[32, 34, 35] The present study also found that 76.1% of participants had favorable attitude towards asking for antibiotics prescription which is much higher than result of Lv et al study whereas16.3%agreed that they could ask the physician to prescribe an antibiotic during the visit.[11] This proved that patients' expectations may contribute to inappropriate antibiotic prescription.

Regarding practice, this study showed that although 56.9% of healthcare workers generally expressed good practice towards antibiotics use, it was found that 56% of them showed poor practice towards buying antibiotic without prescription. This was agreed with finding of Romanian study whereas nearly half of participants used antibiotics without prescription from a specialist.[36] A disturbing fact that was revealed by previous study but was not assessed in this present study was that 50% of physicians treated common colds with antibiotics and 22.9% of physicians prescribed antibiotics through the phone.[37]In agreement with our result, one study showed that more than half of the participants followed self-medication with antibiotics without prescription based on their previous experience and advice by others.[38] Concerning antibiotics usage and storage, our respondents were educated to take antibiotics as prescribed and to store antibiotics and all medications in a special medicine cabinet whereas more than half (63.8%)of them had good practice storage about this issue in contrast to Lv et al study which found more than half of participants (56.5%)had bad practice storage and nearly half of the participants used previously prescribed antibiotics stored in the household.[11] However, another study found that between 40.7%- 78% of people in the Middle East countries used leftover antibiotics.[39] The surplus medicine prescribed the last time reflected the doctor's over-prescription and/or the patient's non-compliance with the prescription[40], and this behaviour may contribute to antibiotic misuse in the community.[41] In our study, 29.4%of healthcare workers had good practice about antibiotic for cold. In contrast to our result, a recent systematic review and meta-analysis found that 52.1% of the sample declared that they take antibiotics for a cold to get better more quickly and 57.4%mentioned that they take antibiotics for a cold to prevent their symptoms from getting worse.[42] In addition, the current study revealed that 54.1% of the studied group had poor practice about preferring broad spectrum antibiotics and29.4% had bad practice about preferring intra venous antibiotics. In Lv et al study, the broad-spectrum antibiotics were chosen by 66.8% of participants and nearly 50% chose intravenous antibiotics which they believed could hasten recovery.[11]

Logistic regression analysis in this study found that occupation (medical staff) and working experience (>5 years) were significant predictors of good knowledge. Also, both working experience (>5 years) and working hours (<42 hours) were significant predictors for good practice while the only predictor of good attitude was the working experience (>5 years). These results were logic and could be explained by the fact that medical staff are more knowledgeable about antibiotics use than paramedical due to the nature of the study. Also the longer years of working experience of course give the health workers more rational knowledge and background, positive attitude and good practice about antibiotics than those with less work experience. Furthermore, with less working hours, the healthcare workers will be more relaxed and not stressed or over loaded so, they can well think and perform and their practice will be finally good. In contrast to our work, a previous study found that profession and years of experience were not significant predictors of healthcare professionals' knowledge, attitude and practices towards Antimicrobial Stewardship.[43] Another study revealed that the logistic regression showed respondents with higher levels of education

tended to have better knowledge, more appropriate attitudes and better practices about antibiotic use while rural respondents were less likely to have better knowledge about antibiotic use, and females were more likely to report better practices.[44]

Despite the importance of this study in addressing the pattern of antibiotics use and assessing the knowledge, attitude and practice of healthcare workers towards antibiotic use in Mehalet-Damana health district, Dakahlia governorate, Egypt, there were some limitations that were mainly related to the methodology. One was the risk for recall bias during completion of the self-administered questionnaire.

Conclusions

The study mainly found that the most common reasons for antibiotic use without prescription were: previous knowledge, mild condition, previous experience, counseling without prescription, costly counseling, easy to buy and others with similar condition. While the reasons for not completing course of antibiotic were improvement, fear of side effects, the antibiotics were forgotten and the antibiotics were kept for future. Also, although the study showed an adequate level of knowledge which resulted in an appropriate practice, the attitude was unfavorable.

Recommendations

Educational interventions on antibiotics use and its association with drug resistance are needed to promote judicious use of antibiotic. Introducing and enforcing antibiotics regulations should be also considered to reduce antibiotics self-prescription. Providing further insight in designing future multifaceted interventions to promote specific messages to rationalize antibiotic use, and compensate for knowledge and attitude gaps as an effort towards preventing development of antibiotic resistance. Also, all primary care health facilities should be included in a training program and prescription of antibiotics should only be done by physicians who have adequate training.

Author Statements

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Ethical Approval

The study protocol was approved by the Institutional Research Board (IRB) of Mansoura faculty of medicine (Code Number: MS.18.08.246). Informed written consent was obtained from each participated healthcare workers in the study after assuring that data will be secured and will not be used for any other purpose. Confidentiality and personal privacy were respected in all levels of the study. Approval of district health management in Mahallat Damanah and directorate of health affairs in Dakahlia was officially obtained. Also approval from the head of the family health center in Mahallat Damanah was verbally obtained before beginning work.

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