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Knowledge, Attitude and Practices of Antimicrobial Use among Veterinarians and Para-Veterinarians in Gaza Strip, Palestine

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A B S T R A C T

Antimicrobial resistance (AMR) is an emerging global public health problem. Rationale use of antimicrobials can prevent the rise of this problem. The objective of this study is to characterize the knowledge, attitudes, and practices of antibiotic usage and AMR among veterinarians and para-veterinarians in Gaza Strip, Palestine. A cross-sectional study was conducted through the collection of a questionnaire from 86 personnel who served as part of a veterinary aid system, in September_ October 2022. The results show that the most common infections treated are respiratory tract infections (18%), mastitis (17%), and diarrhea (17%). The most frequent antibiotics used were penicillin/strepto-penicillin (15.6%), tetracycline/oxytetracycline (15.3%), and erythromycin (5.1%). About one-third (29.6%) of respondents relied on their previous experience when prescribing antibacterial. Nine in ten (90.7%) believed that there is ongoing antibacterial abuse in the veterinarian sector, and two-thirds (63.5%) believed that the use of wide-spectrum antibacterial is better than the narrow spectrum. The large majority of participants (91.9%) considered AMR a serious public health threat. Although most veterinarians and para-veterinarians in Gaza Strip consider the AMR a serious problem, many of them are contributing to the antimicrobial abuse in the veterinary sector. Targeted educational programs on responsible antimicrobial use and AMR are highly recommended for workers in the veterinary field. This should be implemented by regulating and monitoring the use of antimicrobials among veterinarians as well as farmers.

Keywords: biosecurity, antimicrobial resistance, veterinarian knowledge, Gaza Strip

INTRODUCTION

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veruse, self-use, and misuse of antimicrobials has resulted in widespread development of antimicrobial-resistant bacteria and fungi globally (1). Today, the resistance to antimicrobials (AMR) is a severe worldwide public health burden, threatening human and animal health (2). There is a potential to establish resistance against available antimicrobials among all bacteria. This will ultimately result in the loss of effective choices for the treatment of common infections. Recent reports mentioned an expectation that in 2050, about 10 million people are going to pass away annually due to infectious diseases caused by pathogens resistant to antimicrobials (3, 4). Thus, the inappropriate use of antimicrobials in both

humans and animals for infection prevention and management, as well as their use to facilitate growth in animals, has led to the expansion of AMR (2).

The increased public demand for animal products and the international common plans of self-adequacy have led to an increase in livestock enterprises, especially poultry. This has resulted in increased use of antimicrobials for therapeutic, prophylactic, and metaphylactic treatments. Thus, animal health care providers play a crucial role in using antimicrobials in the animal raising sector (5-9). There is convincing evidence correlating improper antibiotic consumption and the speed of antimicrobial resistance development (10, 11). Hence, the wise usage of antimicrobials in health care systems of both animal and human is essential to avoid resistance development (10).

Prudent antimicrobial use is of utmost importance to tackle the risk of the development of antimicrobial resistance (12). Several European countries closely monitor human as well as veterinary antimicrobial use. Applying regulatory programs that aim to decrease antimicrobial resistance and monitor compliance should not be limited only to the national level but also at the individual farm level and at the level of veterinary practices, with specific targets for each (13).

In Palestine, there is no published data about the antimicrobial prescription practices among veterinarians and para-veterinarians. This study aims to evaluate the knowledge, attitude, and practice (KAP) of antimicrobial use, and the compliance to prescription protocols among the veterinary experts, veterinarians, and para-veterinarians_ in Gaza Strip, Palestine.

MATERIALS AND METHODS

Study and Questionnaire Design

A cross-sectional study investigating veterinarians and para-veterinarians was accomplished in September _October 2022. Data was collected by a self-administered structured questionnaire adapted and modified from similar studies conducted elsewhere on KAP of antibiotics and AMR (14-16). The questionnaire comprised in total 44 questions, on three sections: (i) socio-demographic information of the study participants (7 questions) adapted from Vijay et al., (14); (ii) 24 questions to evaluate awareness and background knowledge (14,15); and (iii) 13 questions to evaluate the antibiotic use attitude and practice (14-16) of the burden of AMR in Gaza Strip.

To ensure the quality and validity of the questionnaire, the tool was initially peer reviewed and pre-tested by 10 veterinarians. The questionnaire was then translated into Arabic to ensure a clear understanding of the questions. The list of veterinarians and para-veterinarians was obtained from the Ministry of Agriculture, the others from the Ministry of Health. The questionnaire was sent to 95 candidates, and 86 (90.5% response rate) responded. Participants were asked to fill out the questionnaire voluntarily. A consent paper was obtained from participants.

Statistical Analysis

Data obtained from 86 respondents were entered into SPSS software Version 21 for quantitative analysis.

RESULTS

Sociodemographic Characteristics of Participants

The study population demographics are summarized in Table 1. About half of the study participants (44.2%) were aged below 30 years. Gender distribution was 79 (91.9%) males and 7 (8.1%) females. According to respondents' specialty, 72 (83.7%) studied science/veterinary medicine, 3 (3.5%) were agricultural engineers, 1 (1.2%) studied agriculture sciences, and 10 (11.6%) belonged to the human medical field. Among respondents, 6 (7%) were holding a diploma certificate, 62 (72.1%) had a bachelor's degree, 10 (11.6%) were master's graduates, and 8 (9.3%) were holding a PhD in their specialty.

Table 1. Characteristic of the study population

Characteristics	Frequency	Percentage
Age (years)		
Younger than 30	38	44.2
30-40	18	20.9
41-50	13	15.1
51-60	3	3.5
61-70	14	16.3
Gender		
Male	79	91.9
Female	7	8.1
Specialty		
Science/Veterinary medicine	72	83.7
Agricultural engineer	3	3.5
Agriculture	1	1.2
Others	10	11.6
Level of education		
Diploma	6	7
Bachelor	62	72.1
Master	10	11.6
PhD	8	9.3
Experience (years)		
less than 10	45	52.3
10-20	11	12.8
21-30	11	12.8
31-40	15	17.4
41-50	4	4.7
Location		
Rafah	14	16.3
Khanyounis	39	45.3
Middle	7	8.1
Gaza	18	20.9
North	8	9.3
Sector		
Ministry of Agriculture	15	17.4
Private sector	51	59.3
Others (including the Ministry of health)	20	23.3

Awareness and Knowledge of AMR Burden

Most of the respondents (90.7%) admitted that there is a current antibiotic abuse in the veterinary sector, and a similar proportion (91.9%) considered AMR as a serious problem that impacting public health issue. Two-thirds (67.4%) said yes for supporting the confining 'priority antibiotics' for human-use-only. Of the participants Interestingly, about 90.7% of respondents were aware that

farmers are acquiring antibiotics directly from pharmacists without any prescription from a veterinarian (Table 2).

Two-thirds (67.4%) of the respondents were not familiar with the "New Delhi metallo-beta-lactamase" resistance, and 46 (63.5%) believed that broad-spectrum antibiotics are a better choice than narrow-spectrum antibiotics. Only one out of three (34.9%) of respondents reported having attended or organized any training to improve the knowledge of farmers on antibiotic usage and antimicrobial resistance emergence (Table 3).

Table 2. Perception of antimicrobial resistance burden in Gaza Strip

Variable	Frequency	Percentage
Is there a current antibiotic abuse in therapeutics in the veterinary sector?		
Yes	78	90.7
No	8	9.3
Is antibiotic resistance impacting public health issue?		
Yes	79	91.9
No	7	8.1
Does irrational antibiotics use in animals lead to resistance in humans?		
Yes	71	82.6
No	15	17.4
Does the consumption of expired antibiotics lead to the emergence of resistance?		
Yes	62	72.1
No	24	27.9
Are you confining the restricting 'priority antibiotics' for human-use-only?		
Yes	58	67.4
No	28	32.6
I have experienced that farmers are acquiring antibiotics directly from a pharmacy without having prescription from a veterinary doctor		
Yes	78	90.7
No	8	9.3
Who do you think is responsible for the irrational use of antibiotics in animals at the field level?		
Veterinarian	12	14
Para-veterinarian	16	18.6
Pharmacists	11	12.8
Farmers	61	70.9
Consumers	19	22.1
Interested persons	67	77.9
Others	2	2.3
How frequently have you found a course of antibiotics to be ineffective for animal treatment in the past one year?		
Frequently	14	16.3
Sometimes	56	65.1
Rarely	16	18.6
After antibiotic treatment, do you advise farmers not to use or sell milk up to the recommended withdrawal period?		
Always	77	89.5
Sometimes	9	10.5
Do you instruct farmers to isolate the sick animals?		
Yes	82	95.3
No	4	4.7
Do you instruct the farmers to isolate the suspected animals?		
Yes	83	96.5
No	3	3.5
Do you advice the farmers to raise hygiene measures in their farms		
Yes	83	96.5
No	3	3.5
Do you inform the farmers about the mode of transmittance for infectious diseases?		
Yes	82	95.3
No	4	4.7
Do you advise the farmers to apply insects control measures?		
Yes	80	93
No	6	7
With which practice do you advise farmers more to manage wounds?		
Washing the wound with soapy water	9	10.5
Washing the wound with soapy water & antiseptic	16	18.6
Applying only antiseptic	12	14
Wound suturing	35	40.7
Washing wound with soapy water and use antibiotic	56	65.1
Use the antibiotic only	5	5.8
None	9	10.5

Table 3. Background knowledge about antimicrobial resistance burden in Gaza Strip

Variable	Frequency	Percentage
Do you know about the critically important list of antimicrobials specified by the World Health Organization?		
Yes	66	76.6
No	20	23.3
Are you familiar with superbug New Delhi metallo-beta-lactamase?		
Yes	28	32.6
No	58	67.4
Are you familiar with Livestock-associated methicillin-resistant Staphylococcus aureus (LA-MRSA)?		
Yes	47	54.7
No	39	45.3
Does antibiotic residues in milk/meat lead to emergence of resistance?		
Yes	60	69.8
No	26	30.2
Broad spectrum antibiotics are generally preferred over narrow spectrum antibiotics		
Yes	46	63.5
No	40	46.5
Broad spectrum antibiotics are preferred even when narrow-spectrum antibiotics are available		
Yes	45	52.3
No	41	47.7
I believe that skipping of 1 or 2 doses of antibiotics contribute to the development of antibiotic resistance		
Yes	60	69.8
No	26	30.2
Have you attended any trainings/conferences to update your knowledge on antibiotic usage and antimicrobial resistance?		
Yes	46	53.5
No	40	46.5
Have you attended or organized any training to improve the knowledge of farmers on antibiotic usage and antimicrobial resistance emergence?		
Yes	30	34.9
No	56	65.1

Attitude of Antibiotics Use and Purposes of Prescriptions

Data showed that all of the veterinarians and para-veterinarians regularly prescribe antibiotics. About 18 % of participants indicated the use of antibiotics for respiratory tract infections, 17% of participants used antibiotics for mastitis and diarrhea, while 4% used antibiotics for viral infections (Figure 1).

The most frequent three factors affecting the decision of antibiotics prescription were: (i) relying on previous experience of prescribing (29.6%); (ii) result of culture and susceptibility testing (27.4%); and (iii) withdrawal period (15.7%) in addition to other reasons (Figure 2). The least influential factor was the prescription according to the customer's order.

More than half of the participants (55.8%) reported selecting the spectra of prescribed antibiotics based on the type of disease. One out of five (18.6%) of the study participants preferred to use wide-spectrum antibiotics independent of the disease. The remaining participants based their antibiotic selection on the antimicrobial susceptibility test results (16.3%) and injury location (8.1%) (Table 4). Figure 3 shows that the most frequently prescribed antibiotic is penicillin/strepto-penicillin (15.6%), followed by tetracycline/oxytetracycline (15.3%) and erythromycin (15.1%).

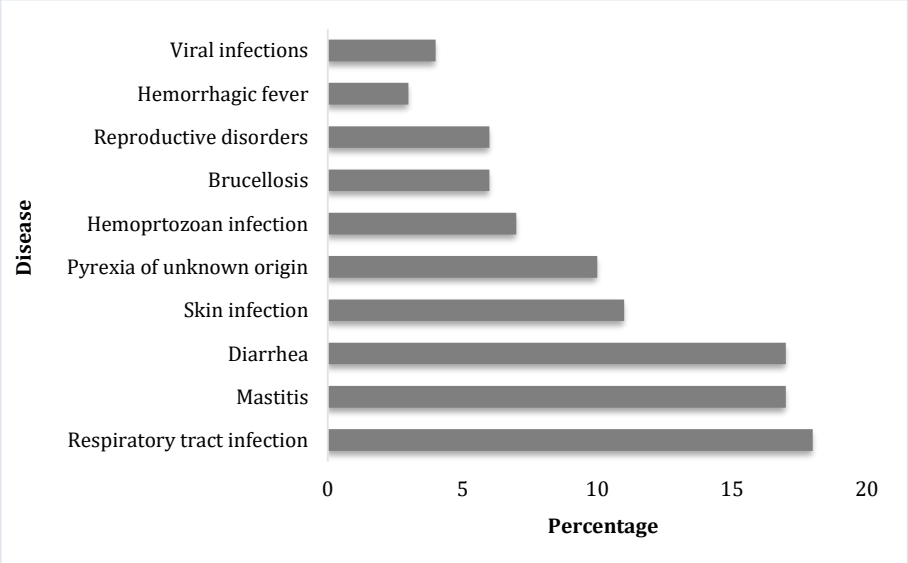

Figure 1. Common reasons for using antibiotics in animals in Gaza Strip

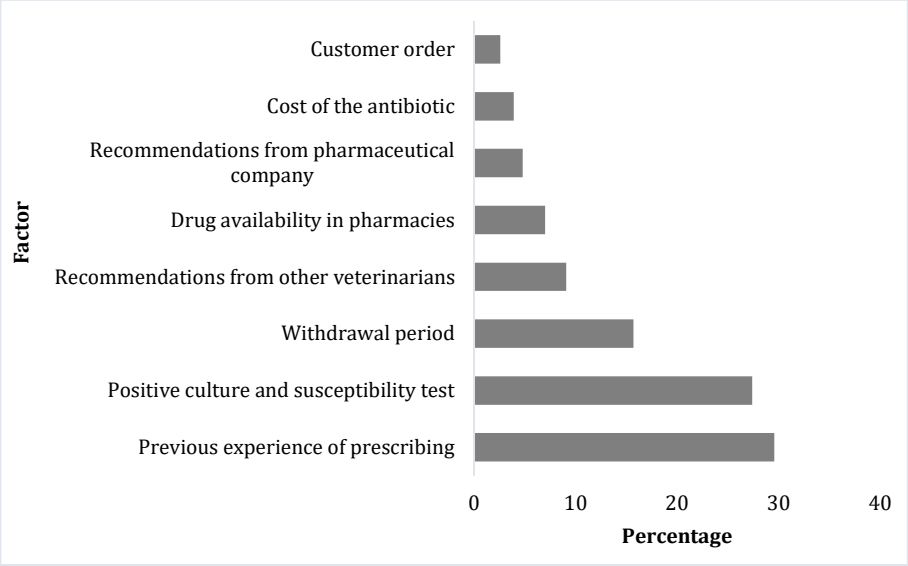

Figure 2. Factors determined the choice of antibiotics use in Gaza Strip

Table 4. The preferred antibiotic spectrum to be prescribed

Criterion	Frequency	Percentage
Wide spectrum	16	18.6
Narrow spectrum	1	1.2
Depends on the disease	48	55.8
Depends on the location of injury	7	8.1
Depends on culture results and AST	14	16.3

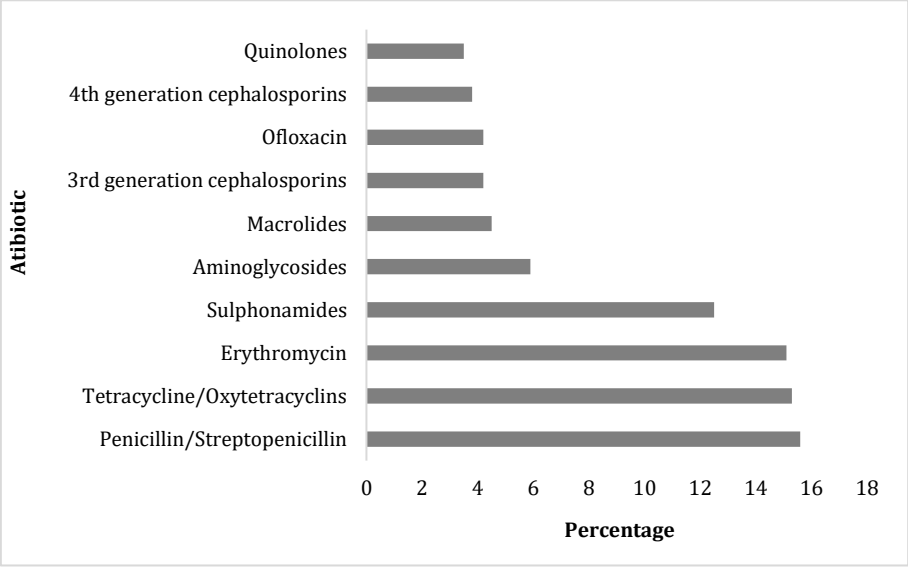

Figure 3. The most common antibiotics used to treat farm animals in Gaza Strip

Practice of antibiotic prescription and usage

The results showed that there was fifty-two (60.5%) of the respondents said that they use a combination of antibiotic and antipyretic to treat pyrexia of unknown cause. Two-thirds (67.4%) of the respondents reported that there is no well-equipped laboratory to perform antimicrobial susceptibility tests in or nearby their clinics

(Table 5). Fifty-three (61.6%) study participants said they never prescribe extra doses of antibiotics to the farmers and most respondents (89.5%) always check the expiration date of antibiotic before dispensing.

Table 5. Participants' practice to antibiotic use and prescription in Gaza Strip

Variable	Frequency	Percentage
What is the first choice of treatment for pyrexia of unknown cause?		
Antibiotics + Antipyretics	52	60.5
Antibiotics alone	4	4.7
Antipyretics alone	25	29.1
Others	5	5.8
Is there a well-equipped laboratory facility for performing antibiotic susceptibility testing available in/near your clinic?		
Yes	28	32.6
No	58	67.4
How often do you use microbiological culture and sensitivity testing to select the most suitable antibiotics during your treatment?		
Always	12	14
Sometimes	50	58.1
Rarely	24	27.9
How often do you direct the farmer for antibiotic consumption through a telephonic conversation?		
Frequently	10	11.6
Sometimes	27	31.4
Rarely	49	57
Do you prescribe antibiotics to farmers who come to you at the clinic without presenting their animals?		
Yes	31	36
No	55	64
Have you ever given extra doses of antibiotic to farmers?		
Yes	33	38.4
No	53	61.6
Do you check the expiry date of the antibiotic before using?		
Always	77	89.5
Sometimes	9	10.5
Do farmers cooperate in the completion of antibiotic course specified by you?		
Yes	56	65.1
No	30	34.9
You support the use of two or more class of antibiotics in combination, because this is always a better choice to manage the infections		
Yes	34	39.5
No	52	60.5

DISCUSSION

This study aimed that assess the knowledge, attitudes and practices of antimicrobials prescription, dispensing, and usage among veterinarians and para-veterinarians in Gaza Strip. Moreover, to evaluate the knowledge about the antimicrobial resistance burden among animal health workers. To date, this study is the first one that conducted to understand the level of KAP among the veterinarians and para-veterinarians in Gaza Strip.

About 44.2% of the study participants were below 30 years of age. The majority of the participants were (79, 91.9%) males. This was in agreement with studies accomplished in Nepal (17), and India (18). According to respondents' specialty, 3 (3.5%) were agricultural engineers, 1 (1.2%) studied agriculture sciences, and 10 (11.6%) belonged to the human medical field. This indicates the implication of personnel whom are not veterinarians in the process of antibiotic prescriptions or use in the veterinary sector. This may influence the AMR burden in Gaza Strip. Most of the respondents (72.1% and 11.6%) had a bachelor's level education, followed by the holders of a master's degree, respectively. This matched with the study population of a previous study (17).

About 90.7% of respondents mentioned the occurrence of ongoing antibiotic abuse in the veterinary field in Gaza Strip. On the other hand, we found generally poor knowledge around the topic of AMR. For example, about 67.4% of the respondents were not familiar with the "New Delhi metallo-beta-lactamase" resistance. In a similar study accomplished in India, 50% of the participants have knowledge about the mechanism of superbugs and antimicrobial resistance (14).

A previous study accomplished in Australia mentioned that one of the factors that is "strongly" influencing the prescription and choice of specific antibiotics by all practice types was the activity spectrum of the antibiotic (whether it is broad or narrow) and the previous clinical experience (15). This is in accordance with our study, in which previous experience of prescribing antibiotics was identified as a leading factor, "about one third (29.6%) of respondents relied on it". At the same time, more than half of the study participants (55.8%) consider the type of disease to selecting the spectra of antibiotic to be applied. Another important factor influencing the choice of antibiotics is the fact that two-thirds of participants agreed that wide-spectrum antibiotics are a better choice than the narrow-spectrum. Taken together, our findings indicate that there is a necessity of the establishment and application of nationwide guidelines for antibiotics prescribing in the veterinary practice. Those guidelines should relied mainly to the microbiological, clinical, and pharmacological indications.

Similar to previous studies (15, 19-23), penicillin/strepto-penicillin, followed by tetracycline/oxytetracyclines, and erythromycin were the most frequently prescribed antibiotics in the animal raising sector in Gaza strip. This could be due to their accessibility and familiarity among the animal health workers, and the diseases prevalent in the region.

Despite the fact that veterinarians always have concerns about their clients satisfaction (24), only very few respondents influenced to prescribed antibiotics according to customers order (Figure 2). This was in agreement with Norris et al., (15). Interestingly, only one out of six respondents relied on the results of culture and antimicrobial susceptibility tests to choose the prescribed antibiotics. This poor practice was explained by the cost of microbiological culture and AST, the lack of fast and inexpensive diagnostic tests for deciding whether antibiotics are compulsory, and the identification of the effective antibiotic for infections. All of these factors have been recognized worldwide as a consistent limitation to the appropriate prescribing of antibiotics by veterinarians (25, 26). Hence, our study confirms the need for the development of rapid, affordable AMR test-kits that can be readily used in the veterinary sector. In this context, about 60.5 % of respondents included antibiotics in their prescriptions to treat pyrexia of unknown origin. This confirms the absence of regulations and specific protocols for antimicrobial use. The respondents may choose to recommend antibiotics even though antimicrobials were not required.

Hence, there is an obvious risk for irrational and unintended use of antibiotics in animals, which may further hasten AMR emergence in Palestine. This calls for the development and implementation of nationwide AMR training and awareness programs with animal health workers as the primary audience so that satisfactory knowledge can be achieved to prevent the misapplication of antimicrobials (18).

In agreement with previous reports (18, 27, 28), most of the participants in this study believed that improper consumption of antibiotics is a driver of resistance. About (91.9%) of the respondents in this study believed antibiotic resistance as a serious public health issue, which this in agreement with a previous study in Bhutan, Nepal (18), Nigeria (29), and Netherlands (30). At the same time, two thirds of respondents believe that it is an advantage to use broad-spectrum antibiotics instead of narrow-spectrum ones. This could be due to the lack of adequate knowledge on antimicrobials and about the adverse effects of broad-spectrum antibiotics, scarcity of data about the antimicrobial sensitivity profiles, and poorly equipped testing facilities in Gaza Strip. Hence, any AMR training should address the causes of AMR and how to make informed decisions on antibiotic use.

Poor adherence to best practices in veterinarian antibiotic prescription contradicts the recognition by veterinarians and para-veterinarians in Gaza Strip that AMR is a serious global public health problem. At the same time, the recognition of AMR as a public health threat provides a good basis for enhancing knowledge about proper antibiotic use and antibiotic resistance through specific training, antimicrobial stewardship programs, and awareness-building campaigns targeting animal health workers and farmers in Gaza Strip. This should be complemented by the provision of AMR rapid lab diagnostic testing, as well as culture and antimicrobial sensitivity tests at a reasonable price. Thus, this can help to overcome the greatest detach between attitudes and practice in antibiotic prescriptions. Finally, it seems crucial to establish national antimicrobial prescription guidelines that can serve as context-specific reference document for future antimicrobial stewardship programs, as well as day-to-day veterinary practice in Gaza Strip.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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المعرفة والمواقف والممارسات المتعلقة باستخدام مضادات الميكروبات بين الأطباء البيطريين وشبه البيطريين في قطاع غزة، فلسطين

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الخلاصة

تعتبر مقاومة مضادات الميكروبات مشكلة عالمية تتعلق بالصحة العامة. حيث أن الاستخدام المنطقي لهذه المضادات يمكن أن يمنع ظهور وتفاقم المشكلة. الهدف من هذه الدراسة هو تقييم مدى المعرفة والمواقف والممارسات المتعلقة باستخدام مضادات الميكروبات بين الأطباء البيطريين و والعاملين في المجال البيطري في قطاع غزة، فلسطين. تم إجراء دراسة مقطعية من خلال جمع استبيان من ٨٦ فرداً يعملون كجزء من نظام الخدمات البيطرية، في سبتمبر_أكتوبر ٢٠٢٢. أظهرت النتائج أن أكثر أنواع العدوى شيوعاً التي تم علاجها هي التهابات الجهاز التنفسي (١٨٪)، التهاب الضرع (١٧٪)، والإسهال (١٧٪). وكانت المضادات الحيوية الأكثر استخدامًا هي البنسلين / الستربتو بنسلين (١٥،٦٪)، والتتراسيكلين / أوكسي تتراسيكلين (١٥،٣٪)، والإريثروميسين (٥،١٪). اعتمد حوالي ثلث (٢٩،٦٪) من المشاركين على تجربتهم السابقة عند وصف مضادات البكتيريا. يعتقد تسعة من كل عشرة (٩٠،٧٪) أن هناك إساءة مستمرة لمضادات البكتيريا في القطاع البيطري، كما أن حوالي ثلثي المشاركين (٦٣،٥٪) يعتقدون أن استخدام مضادات البكتيريا واسعة النطاق أفضل من الطيف الضيق. اعتبرت الغالبية العظمى من المشاركين (٩١،٩٪) أن مقاومة مضادات الميكروبات هي موضوع خطير يتعلق بالصحة العامة. وعلى الرغم من أن معظم الأطباء البيطريين والعاملين في المجال البيطري في قطاع غزة يعتبرون أن مقاومة مضادات الميكروبات مشكلة خطيرة، إلا أن العديد منهم يساهمون بأنفسهم في إساءة استخدام هذه المضادات في البيطرة. لذلك نوصي بشدة باعتماج برامج تعليمية موجهة تستهدف العاملين في المجال حول الاستخدام المسؤول لمضادات الميكروبات. وينبغي تنفيذ هذه البرامج بشكل منظم، ومراقبة استخدام مضادات الجراثيم بين الأطباء البيطريين وكذلك المزارعين.

الكلمات المفاحية: الأمن الحيوي، مقاومة مضادات الميكروبات، المعرفة البيطرية، قطاع غزة