AGRITROPICA Journal of Agricultural Sciences

Content is available at:
https://ejournal.unib.ac.id/jagritropica
ISSN: (Print) 2621-217X, (Online) 2621-699X
Agritropica. J. Agr. Sci. 8 (2): 81-87 November 2025

Assessing the Awareness of Using Veterinary Medical Drugs Among Village Animal Health Workers in Battambang Province

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Article info: Submitted: 2025-08-31, Accepted: 2025-10-14, Publish: 2025-11-30

ABSTRACT: AMR is a serious health issue in the 21st century as infections caused by resistant organisms become harder to treat, leading to longer illnesses, more hospital visits, and a higher risk of death. In parallel, it is also affecting Cambodia's health and economy. This study aims to understand rural veterinarians' knowledge, attitudes, and practices regarding antimicrobial resistance in a northern province of Cambodia. The target districts were purposefully chosen and include Battambang City, Sangkae District, Moung Russei District, and Bavel District. Village Animal Health Workers (VAHWs) were randomly selected and interviewed using a structured questionnaire. All respondents, all of whom were veterinarians, were male. Among them, 33% had completed primary education, while only 4% had completed higher education. The services provided by VAHWs and in treatment are not significantly different (P>0.05), with the majority of services being for cattle (100%), swine (71%), and buffaloes (7%). However, all veterinarians (100%) were aware of antimicrobial resistance, with 44% learning about it through training courses. Among these, 84% expressed concern, citing increased difficulty in treatment and diagnosis. Furthermore, 61% believed antibiotics could be used for prevention, while 26% used them to promote growth. It is concluded that antimicrobial resistance in Battambang is a serious concern. Therefore, VAHWs should be empowered through capacity-building, and relevant institutions should strengthen regulations governing the use of veterinary medicines to promote better practices. Additionally, the phrase 'use antibiotics with caution' should be included on packaging in Khmer script.

Keywords: Village animal health workers, behaviour, animal disease, antibiotic

Reference to this paper should be made as follows:
Nget., V and Morm., S. 2025. Assessing the Awareness of Using Vet-Medical Drugs Among Animal Health Workers in Battambang Province. Agritropica. J. Agr. Sci. 8 (2): 81-87. Doi: https://doi.org/10.31186/J.agritropica.8.1.81-87.

INTRODUCTION

In 2023, 54.2% of households in Cambodia depended on agricultural activities for their livelihoods, with women participating at a higher rate than men—73.5% (MoP, 2024). The livestock sector in Cambodia plays a crucial role in rural livelihoods by providing protein, income, and employment (Sreyleak & Serey, 2024). Over the past decade, the number of households involved in agriculture has declined considerably. Nevertheless, despite this decline, the sector remains the backbone of the national economy. Currently, it faces three principal challenges: climate change, the global economic crisis affecting supply chains, and supply issues (MoP, 2024). Furthermore, feed sources, insufficient labour, technical management, and infectious diseases are additional constraints (Osbjer et al., 2015; Morm et al., 2024). In 2018 alone, antimicrobial use in livestock was approximately 63,000 tonnes (OIE, 2018). Antimicrobial use is increasing annually, with the greatest growth observed in swine and poultry (Boeckel et al., 2015).

Antibiotics are produced solely for animal treatment, but their main applications fall into three categories: treatment, prevention, and growth promotion (FAO, 2014; Black, 1984). Antimicrobial resistance (AMR) arises from microbial resilience and adaptation, influenced by the type and levels of medicines used, and is triggered by their misuse, targeting prevention and growth enhancement (WHO, 2000). AMR has contributed to impacts on animal health and economic challenges in the 21st century (OIE, 2015). The use of antibiotics in livestock that leads to AMR causes failures in animal disease treatment, resulting in increased animal deaths, reduced productivity, and risks to food security (FAO, 2024). Livestock production also faces difficulties related to disease resistance, zoonotic infections, and infectious diseases (Economous et al., 2015). Due to AMR, approximately 700,000 people die annually, and this figure is projected to rise to 10 million by 2050, with Asia accounting for around 50% of this increase (MoH, 2014).

The use of medicines in relevant sectors in Cambodia remains suboptimal, characterized by habitual prescribing practices, limited diagnostic capacity, insufficient microbiological evidence, and the absence of clear diagnostic guidelines. Prescriptions are often given based on patient demand; disease management and hygiene practices are inadequate; narrow-spectrum antibiotics are frequently used, which are ineffective against the causative pathogens; broad-spectrum antibiotics are often employed without proper diagnosis, prioritizing perceived benefits over potential harms (Om et al., 2016). In response to this improper conduct, the Ministry of Health and the Ministry of Agriculture, Forestry, and Fisheries developed and approved the National Policy and Strategic Plan for Antimicrobial Resistance (AMR) for 2015–2017, together with a five-year action plan for 2018–2023. These initiatives were supported and implemented in collaboration with the Food and Agriculture Organization (FAO) and the World Organisation for Animal Health (OIE) to protect human, agricultural, food, and environmental health (MAFF, 2018).

Although these joint policies are in place, outreach activities are not well implemented due to a lack of studies on this topic to demonstrate their importance, as they demand immediate action. Addressing antimicrobial resistance (AMR) requires a comprehensive approach involving stricter regulations, improved access to vaccines, and international cooperation (Tiwari et al., 2025). Battambang province is among the nine leading provinces raising livestock in Cambodia (MoP et al., 2019). Consequently, veterinary pharmaceutical companies have direct contact with livestock farm owners, while agricultural suppliers and veterinary service providers have been highly effective in engaging with farmers (Martin, 2025). This highlighted the need to assess knowledge, attitudes, and practices (KAP), antimicrobial resistance (AMR), and antimicrobial use (AMU) within the Veterinary and Animal Health Workforce System (VAHWs) in Battambang province to understand current practices and inform future interventions.

MATERIALS AND METHODS

Description of study area

This research was conducted in one municipality and included three districts: Battambang municipal, Moung Ruessei, Sangkae, and Bavel. Purposive/judgmental sampling, a nonprobability sampling method, was chosen by most livestock investigators and the top 1-4 Village Animal Health Workers (VAHWs) in Battambang (PDAFF, 2025).

Sampling methods

The sample sites consisted of 70 VAHWs from one municipality and three districts, including Battambang municipal district and the Moung Ruessei, Sangkae, and Bavel districts in Battambang province, selected to be representative. Yamane (1973) was used to determine the sample size, and a stratified sampling method was employed, as shown in Table 1 (Yamane, 1967).

$$n = \frac{N}{1 + N\,(e)^2}$$

Whereas:

n	Sample size representative
N	Population size denotative
e	Precision levels
1	Constant

$$n = \frac{232}{1 + 232\,(0.1)^2} = 70$$

The interview sampling in the municipality and districts

$$n_i = \frac{n \times N}{N}$$

Whereas:

N	Total in four regions (232 VAHWs)
n	Total sample size of VAHWs
n_i	VAHWs sampling interviews

Table 1. Interviewed sample size in each region

Region	VAHWs	Interviewed sampling
Sangkae	64	19
Bavel	72	22
Battambang	45	14
Mong Ruessei	51	15

Data type and collection methods

The primary data were gathered through semi-structured questionnaires for interviews with key informants and stakeholders, and through direct field observations of village animal health workers' (VAHWs) practices regarding knowledge, attitudes, and antimicrobial resistance. Before the interview, the provincial department of animal health and production provided a combined list of all VAHWs in Battambang, and 70 were randomly selected for the in-person interview. The data collection team, consisting of 6 experienced members, was oriented and piloted before the field excursion. Secondary data has been collected from various written documents, both public and unpublished.

Data analysis

Descriptive statistics, including frequencies and percentages, were calculated to summarize participants' demographic and household characteristics, as well as their self-reported antimicrobial knowledge, attitudes, and practices (KAP). Inferential analysis was conducted using IBM SPSS Statistics. A chi-square test of independence was performed to examine the relationship between the two categorical variables: education level and service provider of VAHWs. All statistical tests were conducted using a predetermined significance level of alpha=0.05.

RESULTS AND DISCUSSION

Table 2 shows that all respondents (100%) were male. The researcher concludes that this is because the veterinary profession requires significant physical labour and involves risks when dealing with large animals, leading many women who previously practiced in this field to leave it. According to the list from the Battambang Provincial Office of Production and Animal Health, there were female veterinarians several years ago, but they have since become inactive. 51% of the interviewees are aged 51-60, indicating they have been practicing as veterinarians for a long time.

Table 2. General information based on the target area

Parameter	VAHWs (n=70)	
	Respondents	%
Gender		
Male	70	100
Female	-	-
Age		
20-30	2	3
31-40	14	20
41-50	14	20
51-60	36	51
>60	4	6
Education levels		
University	3	4
High school	22	31
Secondary school	20	29
Primary school	23	33
No education	2	3
Institutional strengthening		
Intuition	48	68
NGO	23	32
Animal service providers		
Poultry	24	34
Bovine	70	100
Swine	50	71
Canine	7	10

As for veterinarians aged 30–40 and 41–50, each group makes up 20%. Most interviewed veterinarians have completed primary education (33%), high school (31%), and lower secondary school (29%). Only 4% have completed higher education. Regarding institutions that have contributed most to strengthening their capacity, 68% are state institutions/universities, while 32% are non-governmental institutions. All (100%) of

the veterinarians interviewed provide services for cattle. 71% provide services for pigs, 34% for poultry, and 10% for dogs. As for buffalo, only 7% of farms offer services to them, as this animal is not popular for rearing in Battambang.

The Knowledge, Attitude, and Practice (KAP) of village animal health workers (VAHWs) was assessed in this study. It is found that VAHWs in Battambang province of Cambodia have a limited understanding of antibiotic use, with 61% believing the drugs can be used for disease prevention and 26% for growth promotion. This result finding was like studies in southern Cambodia, which found that livestock farmers, village animal health workers (VAHWs), and veterinary drug retailers have low to moderate knowledge of antimicrobial use and resistance (Chea et al., 2022; Chea et al., 2023), and similar alignment with livestock producers in Thailand (Nuangmek et al., 2018). This highlights that KAP parity on VAHWs is common across the country, demanding immediate strengthened action from policymakers. Basically, antibiotics overcome an infection by killing or inhibiting bacterial growth, suggesting they could play a role in limiting the inflammatory response (Labro, 2022). Inflammation is one of the body's immune responses to trauma or foreign invasion and can be harmful (Ricciotti et al., 2011).

Regular capacity building for rural technicians is key to enhancing and refreshing their knowledge, and it is believed that the lack of this activity contributes to improper antibiotic use and inconsistent vaccination practices, as also reported in a previous study (MacPhillamy et al., 2019). In Battambang, it also highlights a gender disparity among village veterinarians, who are predominantly male, a pattern that also holds at the country level (Sieng et al., 2021; Morm et al., 2024). Highly cautionary antibiotics, widely used in Battambang province, reflect practices in southern Cambodia (Kim, 2020). While VAHWs in Battambang possess a moderate level of knowledge, their practical application remains low. This indicates that public health is not a significant concern for them, driven by individual economic benefits and a loosening of inspection by authorities. This contrasts with findings from southwestern Cambodia, where VAHWs and drug retailers demonstrated moderate knowledge, positive attitudes, and moderate practices regarding antimicrobial use (Chea et al., 2023).

Figure 1 presents key survey findings on KAP regarding antibiotics. In section (a), it is illustrated that 100% of VAHWs are aware of AMR. The familiar sources for information included training courses (45%), social media

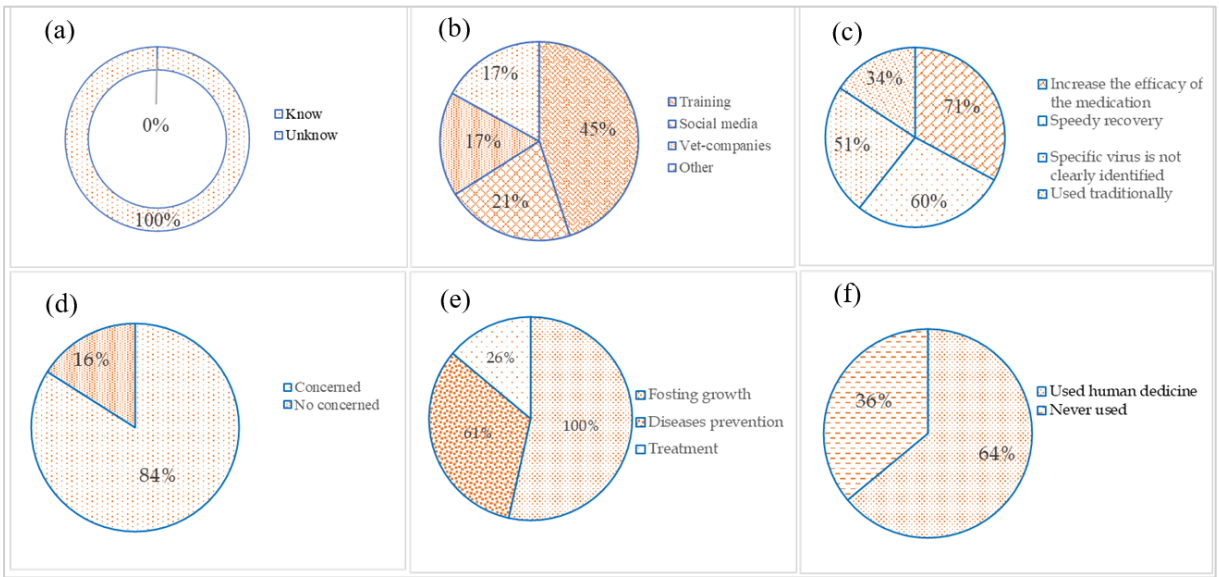

Figure 1. Knowledge and attitude based on antimicrobial resistance, while (a) antiviral resistance awareness, (b) information sources, (c) medical justification for using multiple drug types, (d) antimicrobial resistance, (e) knowledge on using antibiotics, (f) using human medication for animal treatment.

tools (21%), promotional events of veterinary companies (17%), while another 17% from friend-to-friend relationship or another similar way represented (b). VAHWs responded that they had all previously mixed more than two types of antibiotics. The reasons (c) for mixing these antibiotics are to help animals recover quickly (71%), to increase drug effectiveness (60%), unclear about the exact pathogens (51%), and habitual use (34%).

In addition, perception of this resistance elucidated that 84% of VAHWs expressed concern (such as drugs becoming less effective, treatment becoming more difficult, or more challenging to diagnose diseases). In comparison, 16% of VAWHs showed no concern, believing that advances in science would solve the problem or that they would follow instructions given by others, as shown in (d). Indicated (e) nevertheless, VAHWs (100%) correctly identified antibiotics as a treatment for bacterial infections, many also incorrectly believe they can be used for disease prevention (61%) and growth promotion (26%). This misuse, which is contrary to official guidelines, risks increasing antimicrobial resistance. While (f) presented that 64% of VAHWs used human drugs for animal treatment, indicating a high AMR risk.

Table 3. Correlation of Chi-Square with VAHWs in the target regions

Variance	Battambang	Sangkae	Bavel	Moung Ruessei	Pearson's X^2 (df)
	(Resp,%)	(Resp,%)	(Resp,%)	(Resp,%)	
Education (n=70)					
GOV	9(10.6)	7(8.24)	6(7.06)	5(5.88)	$X^2 = 0.27$
NGOs	17 (20)	16(18.8)	12(14.1)	13(15.29)	Pr=0.96
Service providers (n=120)					
Bovine	14(11.7)	19(15.8)	22(18.3)	15(12.5)	$X^2 = 0.04$
Swine	10(8.33)	14(11.7)	16(13.3)	10(8.33)	Pr= 0. 99

Note: Resp=Respondent; GOV=Government; NGOs=non-government organization; significant (P<0.05); Non significant (P>0.05)

Table 3 found that VAHWs in the four regions targeted by respondents in the education sources showed no statistically significant difference (P>0.05), with X2=0.27 and Pr=0.96. In addition, the type of service provider is not statistically significant across the region ($\chi 2 = 0.04$; $p = 0.99$).

The indiscriminate use of antibiotics, particularly for preventive purposes, will contribute to antimicrobial resistance, posing a global health threat. When antibiotics are mixed or used arbitrarily, the risk of developing resistant bacterial strains increases. The belief that antibiotics can be used preventively reflects a complex interplay of trust in medicine, limited access to formal care, and community norms. The findings suggest an urgent need for community-level education and policy interventions to promote rational antibiotic use and safeguard public health. In addition, enhancing veterinary drugs should receive greater consideration and broader dissemination to all stakeholders in Battambang and across northwest Cambodia.

CONCLUSION

All village animal health workers (VAHWs) play a vital role in providing animal health services to livestock farmers. KAP of VAHWs in Battambang is under-skilled in veterinary medicine, anti-drug use, and management of infectious animal diseases, as well as in preventing and improving animal health. While animal health is the core element, it has an indirect impact on humans. Thus, drug families recommended for highly critical use by WHO and relevant ministries, such as Quinolone and Aminoglycoside families, are also widely utilized by VAHWs, raising concerns for public health in Cambodia. Thus, concluded that the use and management of animal drugs are still of concern with VAHWs on AMR and enhancing growth performance.

SUGGESTION

As VAHWs are engaged in the administration of veterinary drugs to animals, future concerns may arise. Therefore, it is essential to strengthen knowledge of AMR and AMU among VAHWs and stakeholders, as these are priority considerations. Thus, animal microbial drug use requires annual training for VAHWs, with professional animal livestock officers or related expertise, to enhance the "One Health Approach" to sustainable and effective veterinary services in Battambang province, Cambodia. Moreover, the Cambodian national level should prioritize it for control. Additionally, the phrase "use antibiotics with caution" should be included on packaging by using Khmer scripts.

ACKNOWLEDGMENTS

The author thanks the Graduate School of the National University of Battambang (NUBB), which has granted us the authority to conduct surveys in the target districts. We thank the Office of Animal Health and Production of the Battambang Provincial Department of Agriculture, Forestry, and Fishery (PDAFF) of Cambodia, which arranged the VAHWs for interviews and some related documentaries. It is also grateful to the Commune Agriculture Officers at the four selected districts for supporting the data collection activity. Special thanks are due to the family for their motivation and financial support in conducting this research.

CONFLICT OF INTEREST

The author declares that there is no conflict of interest.

FINANCIAL SUPPORT FUND

There is no support fund.

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