



Original article

Antibiotic usage among the elderly in Tan Loi commune, Dong Hy district, Thai Nguyen province, Vietnam

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Abstract: Introduction: Antibiotic resistance has been determined as a global threat. Inappropriate use of antibiotics is a crucial driver of the evolution of resistance. **Methods:** A cross-sectional study was conducted aiming to describe the antibiotic usage among the elderly (60 years old and above) in Tan Loi commune, Dong Hy district, Thai Nguyen province, Vietnam in 2020. The questionnaire survey was submitted to 370 participants. **Results:** More than half of the participants were female. The proportion of the elderly who bought antibiotics using a prescription was 39.2%. The participants normally bought the medicines the same as the previous (53.0%), medicine seller's advice (44.9%), and relatives/friends' advice (15.4%). More than half of the participants bought antibiotics themselves (57.8%). Local private pharmacies and health centers/hospitals were common locations for buying antibiotics, 63.8%, and 34.1% respectively. The percentage of the participants who stopped taking antibiotics when the symptoms are gone was 54.1%. More than 50.0% of the participants would change to more expensive antibiotics in case of symptoms are not released after using antibiotics. Some factors significantly associated with prescription usage were education levels, ethnic, obtained information related to antibiotic uses, others helping to buy the antibiotics. **Conclusions:** The proportion of the elderly using antibiotics with a prescription was low. Majority of the participants bought antibiotics from the local private pharmacies. The main source of information to buy antibiotics was as the last time and medicine sellers. Some factors significantly associated with prescription use were education level, ethnicity, obtained information related to antibiotic uses, individuals who buy the medicines. Interventions are needed to improve knowledge and practice in buying antibiotics not only for the elderly but also for health service providers, private pharmacies in particular.

Keywords: Antibiotic usage; elderly; Vietnam.

1. INTRODUCTION

Antibiotic resistance has been determined as a global threat [1-6]. Inappropriate use of antibiotics is determined as a crucial driver of the evolution of resistance [1-3]. It leads to longer hospital stays, higher medical costs, and increased mortality [2, 7, 8]. Therefore, using antibiotics properly is crucial in treatment and reducing the burden of the diseases.

Over the 15-year period from 2000 to 2015, overall use of antibiotics per capita as the first-line medicine increased by 26.2% worldwide [1]. The utilization of antibiotics in the elderly (≥ 60 years old) tended to increase [9]. A study in Spain revealed that the consumption of antibiotics among the elderly rose significantly between 2003 and 2014 in both sexes, averaging 5.6% per year in men and 6.2% in women. This increase was related to education, marital status, income, lifestyle, examination in medical centers, and disability status

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[10]. Vietnam is ranked as one of the top countries with a high proportion of antibiotic resistance in Asia [11, 12]. Antibiotics accounted for more than 50.0% of medicines for treatment in Vietnam, and it was commonly sold by community pharmacies, however, from 88.0 to 97.0% of the medicines were distributed without a prescription although it is forbidden [13, 14].

Increasing age is a natural process in humans. It has been determined as a risk factor for diseases. A cross-sectional study of 2400 people aged 60 and older indicated that chronic disease was present in 76.7% of the participants with 39.2% classified as living with multimorbidity. The popular comorbidities among the elderly included cardiovascular disease, digestive diseases, respiratory diseases (chronic obstructive pulmonary diseases, tuberculosis), arthritis, genitourinary, and diabetes[15]. The chronic diseases could lead to or combine with a variety of infections, respiratory infection in particular [7, 16]. It could be enhanced by the changes that gradually appeared along with the age such as weakening of the immune system, impaired function of the skin, mucous barrier, or impaired respiratory system function, etc. [7, 17-20]. Therefore, it is important to describe the situation of antibiotic usage among the elderly to provide scientific evidence for health service planning and policy makers. The current epidemiological studies in Vietnam were mainly conducted in children under five or general population [21-23]. Therefore, this study aimed to describe the situation of antibiotic usage among the elderly.

2. MATERIALS AND METHOD

2.1. Study settings

This study was conducted in Tan Loi commune, Dong Hy district, Thai Nguyen province. Tan Loi is a midland mountainous commune located in the Southeastern part of the district. According to an official report of the district in April 2019, the population was 5064 people (49.3% female). There were nearly 500 elderly people accounted for approximately 10.0% of the population.

2.2. Study design and participants

A descriptive cross-sectional study was conducted from April to September 2020. Elderly people from 60 years of age and above, who did not suffer from any hearing, speech, or mental disorders and had a permanent address in the study setting were invited to participate in the study.

An interviewer-administered questionnaire was performed to gather data regarding antibiotic usage among the elderly. The questionnaire consisted of two parts including baseline characteristics and antibiotic usage among participants. The questionnaire was initially written in Vietnamese in lay language. The initial questionnaire was reviewed by an expert in Epidemiology and an expert in Community Health. After that, it was performed by 30 participants to check for the completion and overall interview duration before implementation. There were not any tests performed to test the questionnaire.

The study was approved by the Ethics Committee of the Thai Nguyen University of Medicine and Pharmacy (No. 576/ĐHYD-HĐĐĐ).

2.3. Sample size and sampling

The sample size was determined according to the formula to the estimated proportion in a descriptive study [24]:

$$n = Z^2 \frac{\alpha}{1-\alpha}$$

The sample size was calculated using a proportion of people buying antibiotics using their prescriptions at 40.0% [21] with 5.0% marginal error and 95% confidence. The required sample size was 370.

Simple random sampling method was performed. The participants were randomly selected using the list of elderly people which was provided by the local health station. The list was originally grouped by villages including cardinal numbers from 1 to the end. Sample function in R was utilized to randomly select the participants. The participants were recruited after receiving their agreements to participate in the study.

2.4. Statistical analysis

Descriptive statistics were performed to describe variables including frequency, percentage. Associations between prescription usage and independent variables were assessed by univariate/multivariate logistic regression. The independent variables included in the analysis were gender, age group, ethnic, education level, occupation, chronic disease, economic status, family size, others help to buy medicines, locations to buy medicine, obtained information related to antibiotic uses. All significant factors in univariate analysis were included in multivariate analysis by purposeful selection. Statistically significant was set at 0.05. Data analysis was performed using R.

3. RESULTS

Overall, 370 participants participated in the study. The baseline characteristics are illustrated in Table 1. More than half of the participants were female (55.7%). Kinh ethnicity was 39.7%. The majority of participants were farmers or workers (62.7%). Education level of participants included college or above (12.2%), high school (28.6%), secondary school (42.2%), and primary school (17.0%). A large proportion of participants were living with their husband/wife (78.1%). The percentage of the participants suffering from at least one chronic disease was 84.3% (including hypertension, COPD, tuberculosis, asthma, coronary heart diseases).

A large proportion of participants normally bought antibiotics without a prescription (60.8%). The participants normally bought the medicines the same as the previous (53.0%) or followed advices from medicine sellers (44.9%) and relatives/friends (15.4%). More than half of the participants bought antibiotics themselves (57.8%). Local private pharmacies and health centers/hospitals were common locations for buying antibiotics, 63.8% and 34.1% respectively (Table 2).

Most people took antibiotics after meals (75.4%), the remaining ways only accounted for less than 25.0% in total. The proportion of the elderly who took antibiotics as the seller's instructions was 63.8%, followed by their physician's guidance (37.6%). The percentage of participants who stopped taking antibiotics themselves when the symptoms are

gone was 54.1%, followed by a doctor's prescription (21.1%) and seller's instructions (24.3%).

Table 1. Baseline characteristics of the participants

Variables	Frequency	Percentage
Gender		
Male	164	44.3
Female	206	55.7
Ethnic		
Kinh	147	39.7
Tay	92	24.9
Nung	90	24.3
Others	41	11.1
Occupation		
Farmer	151	40.8
Worker	81	21.9
Retired	102	27.6
Others	36	9.7
Education level		
Primary school	63	17.0
Secondary school	156	42.2
High school	106	28.6
College or above	45	12.2
Marital status		
Single	2	0.5
Married	289	78.1
Divorced	79	21.4
Family economic status		
Poor	2	0.5
Near poor	79	21.4
Sufficient	251	67.8
Have saving	38	10.3
Health insurance		
Yes	349	94.3
No	21	5.7
Chronic disease (hypertension/COPD/tuberculosis/asthma/coronary heart diseases)		
Yes	312	84.3
No	58	15.7

Table 2. Approaching antibiotics among the participants

Variables	Frequency	Percentage
Using prescriptions to buy antibiotics		
Yes	145	39.2
No	225	60.8
Person often buys antibiotics		
Offspring/son or daughter-in-law/grandchildren	88	23.8
Husband/wife	68	18.4
By themselves	214	57.8
Locations buying antibiotics		
Local private pharmacy	236	63.8
Local health center/Public hospital	126	34.1
Private clinics	8	2.2
Sources of information to buy antibiotic		
The antibiotics which were used last time	196	53.0
Relatives/friends' advices	57	15.4
Drug sellers	166	44.9
Information from the internet	14	3.8

Regarding instructions for doses, the participants were likely to take it from medicine sellers (63.8%). In case they forgot to take a dose of antibiotics, some of them would

immediately take the forgotten dose as soon as they could remember (52.7%), or skip that dose and continue to take the next dose (41.9%). A double dose would be taken for the next time (5.4%).

A majority of participants took medicines with plain water (74.6%), the rest drunk with tea/milk/fruit juice (25.4%). Antipyretic/painkiller was the most commonly used with antibiotics (64.6%), followed by traditional medicine (28.6%), and flu medicine (10.3%). Only 24.1% of the elderly took antibiotics without any other medicines (Table 3).

Table 3. Taking antibiotics in the elderly

Variables	Frequency	Percentage
Time to use the antibiotics		
After meal	279	75.4
Before meal	28	7.6
Any time that I can remember	26	7.0
According to drug sellers	22	5.9
According to doctor's guides	15	4.1
The instructions for taking doses of antibiotics		
According to sellers' guides	236	63.8
According to the prescription	139	37.6
According to information on its labels	74	20.0
According to guidelines from the internet	5	1.4
Time that the elderly normally stop taking antibiotics		
After the symptoms are gone	200	54.1
According to the drug seller's guides	90	24.3
According to the doctor's guides	78	21.1
Right after the symptoms released	2	0.5
After 5-7 days	0	0
What has been done if the elderly forget taking a dose of antibiotic		
Take the forgotten dose right when they remember	195	52.7
Omit it and use a normal dose for the next time	155	41.9
Use double dose for the next time	20	5.4
Drinks normally used while tanking antibiotic		
Plain water	276	74.6
Tea/milk/fruit juice	94	25.4
Soft drinks	0	0
Taking other drugs along with antibiotics		
Antifebrile/painkiller	239	64.6
Traditional medicine	106	28.6
None	89	24.1
Influenza medication	38	10.3
Vitamin	18	4.9
Other	17	4.6

More than 50.0% of the participants would change to more expensive antibiotics if the symptoms not released after using antibiotics. When experiencing undesirable symptoms, the participants often went to doctors (48.1%), stopped taking medicines (27.0%), bought other medicines themselves, or continued taking the current medicines (Table 4).

Table 4. Referred undesirable effects of antibiotics and participants' management

Variables	Frequency	Percentage
Behaviors when symptoms do not improve after using antibiotics		
Use other more expensive antibiotics	206	55.7
Go to medical doctors	104	28.1
Increase the dose	52	14.1
Change to traditional medicine	8	2.2
Reported undesirable effects		
Allergies	198	53.5
None	134	36.2
Diahrrea	92	24.9
Nausea/Vomit	27	7.3
Headache	20	5.4
Stomachache	20	5.4
Dizziness	0	0
Managements in cases of undesirable effects		
Go to medical doctors	178	48.1
Stop the antibiotics	100	27.0
Keep using the current antibiotics	65	17.6
Buy another antibiotics instead	50	13.5

Results from univariate/multivariate analysis revealed the factors associated with prescription usage among the elderly (details were presented in Table 5). Gender and age were not associated with the use of prescriptions when buying antibiotics. The elderly who are ethnic minorities were 2.26 times more likely to use prescriptions than the Kinh (OR = 2.26, 95%CI 1.45-3.53). Elderly people who are from high school or above were more likely to use prescriptions to buy antibiotics than those with lower education level (OR = 2.42, 95%CI 1.58-3.72). Occupation was also a significantly associated factor, the elderly who are farmers were less likely to use prescriptions when buying antibiotics compared to other occupations (OR = 1.71, 95%CI 1.11-2.63). The elderly who buy medicines themselves were more likely to use prescriptions compared to those who had to ask others for help (OR = 3.11, 95%CI 1.97, 4.89). The elderly who have been educated about antibiotics often used prescriptions than those who have never been educated or not remembered (OR = 3.99, 95%CI 2.57 - 6.22). Multivariate analysis demonstrated significant factors associated with prescription usage such as ethnic group occupation, locations to buy antibiotics, and the individuals who buy the medicines. Locations to buy antibiotics strongly associated with prescription use (OR= 6302.6, 95%CI 617.4 – 64336.6) after adjusted for ethnic group, education level, occupation, other helps to buy medicine, and obtained information related to antibiotic uses.

Table 5. Univariate/Multivariate analysis demonstrating factors associated with prescription usage among the participants

Variable	Use prescription		Not use prescription		Crude OR (95%CI)	p-value	Adjusted OR (95%CI)	p-value
	n	%	n	%				
Gender								
Female	83	40.3	123	59.7	1			
Male	62	37.8	102	62.2	0.9 (0.59 – 1.38)	0.627		
Age								
60-69	58	36.0	103	64.0	1			
70-79	58	42.3	79	57.7	1.3 (0.82-2.08)	0.266		
80-89	27	39.1	42	63.9	1.14 (0.64 – 2.04)	0.655		
From 90	2	66.7	1	33.3	3.55 (0.32-40.02)	0.305		
Ethnic group								
Kinh	41	27.9	106	72.1	1		1	
Others	104	46.64	119	53.36	2.26 (1.45-3.53)	<0.001*	2.24 (0.7-7.16)	0.174
Education level								
Secondary school and lower	67	30.59	152	69.41	1		1	
From high school	78	51.66	73	48.34	2.42 (1.58-3.72)	<0.001*	3.22 (0.85-12.19)	0.085
Occupation								
Farmer	48	31.8	103	68.2	1		1	
Others	97	44.3	122	55.7	1.71 (1.11-2.63)	0.016*	0.23 (0.06-0.92)	0.038*
Economic status								
Poor/near poor	29	35.8	52	64.2	1			
Sufficient/have saving	116	40.14	173	59.86	1.2 (0.72-2.0)	0.48		
Live alone								
No	133	38.3	214	61.7	1			
Yes	12	52.2	11	47.8	1.76 (0.75 – 4.09)	0.193		

Table 5. (continue)

Variable	Use prescription		Not use prescription		Crude OR (95%CI)	p-value	Adjusted OR (95%CI)	p-value
	n	%	n	%				
The person who helps to buy medicines								
Others	38	24.36	118	75.64	1		1	
By themselves	107	50.0	107	50.0	3.11 (1.97 – 4.89)	<0.001*	0.17 (0.035-0.86)	0.032*
The locations to buy antibiotics								
Local private pharmacy	13	5.5	223	94.5	1		1	
Local health center/Public hospital/private clinic	132	98.51	2	1.49	1132.2 (251.56-5095.2)	<0.001*	6302.6 (617.4-64336.6)	<0.001*
Obtained information related to antibiotic uses								
No/Not remember	56	28.8	161	74.2	1		1	
Yes	89	58.2	64	41.8	3.99 (2.57 – 6.22)	<0.001*	0.68 (0.14-3.31)	0.631
Chronic disease (hypertension/COPD/tuberculosis/asthma/coronary heart diseases)								
Yes	127	40.7	185	59.3	1			
No	18	31.0	40	70.0	0.66 (0.36-1.19)	0.168		

4. DISCUSSION

The respondents who used antibiotics according to prescription accounted for 39.2%. This proportion was slightly lower than a study conducted in adults by Tran The Hoang in Thai Nguyen province showing that 40.0% bought medicines using prescription [21]. The proportion was much higher than a study conducted in Iran among the elderly showing that the proportion of self-medication was more than 80.0%, which meant only about 20.0% purchased medicines using prescriptions [25]. The real proportion of non-prescription medicine purchases in the community can be higher due to the high proportion of non-prescription sales in retail pharmacies (from 62.1% to 70.0%) [26, 27], or in a study conducted in Vietnam in 2014 revealed that 88.0% antibiotics sold in rural pharmacies were without a prescription [28]. The purchase of antibiotics without prescriptions as well as the improper use not only affects the current treatment but also leads to consequences in the future by increasing the risk of antibiotic resistance/multidrug resistance [2]. It is even more serious that medicine sellers and customers' knowledge of antibiotics and antibiotic resistance were low, particularly in rural areas [28]. Thus, the patients might suffer from a higher burden of severer infections and complications, longer hospital stays, and higher medical costs in following episodes [2, 7, 8]. In addition, the arbitrary use of medicines without prescriptions can be associated with undesirable effects. Therefore, interventions should concentrate on health education programs as well as enhancing the enforcement of current regulations regarding appropriate antibiotic usage.

The adverse effects reported by the participants including diarrhea (24.9%), headache (5.4%). The proportion of taking antibiotics with allergies accounted for 53.5%. This proportion was much higher than the previous study conducted in adults [21], it is probably from different assessments of the elderly on allergy symptoms, and the higher frequency of diseases and antibiotic use among the elderly [29].

Most participants bought antibiotics from local private pharmacies (63.8%), local health stations/hospitals (34.1%), and only 2.2% from private clinics. These percentages were

different from the study of Nguyen Thi Thanh which indicated 43.6% getting from private pharmacy [30]. Besides, the participant's assessment of how easy to buy antibiotics was easy/very easy accounted for over 90.0% and all of them reported that their neighbors normally bought antibiotics on their own. This is clear evidence that interventions are needed to improve knowledge and practice in buying antibiotics not only for the elderly but also for health service providers, especially for private pharmacies. This plays a major role while Vietnam is one of the top countries with a high proportion of antibiotic resistance in Asia [2, 11, 12].

There were significant relationships between educational levels, ethnicity and antibiotics use among the elderly. Accordingly, those with education levels from high school or higher (OR = 2.42, 95% CI 1.58-3.72) tend to use prescription to buy antibiotics compared to those with lower education levels. This result was consistent with Faranak Jafari et al. showing that both gender and education level associated with self-medication (without prescription) [25]. It could be because those with high education can obtain and have better knowledge about antibiotic usage, thereby partly reflecting the more appropriate behavior of using antibiotics. However, this study showed that there was no relationship between sex and behavior of prescription use. This result agreed with Tran The Hoang et al. showing that there was no difference in medicine purchase with/without prescription in Thai Nguyen, Vietnam [21]. The difference could be due to distinguished social features regarding gender between Vietnam and Iran.

Notably, the respondents who are minority ethnic tended to use prescriptions compared to the Kinh (OR = 2.26, 95% CI 1.45-3.53). This result was in contrast to some other studies [21]. This may be due to the easier accessibility of the majority ethnic group and the inadequate habit of using antibiotics.

There was a statistically significant relationship between occupation and prescription use, elderly farmers were less likely to use prescriptions when buying antibiotics than in other occupations (OR = 1.71, 95% CI 1.11-2.63). It could be an interactive relationship, as the majority of workers and civil servants and retirees tend to have higher education levels than the farmer, so their behavior might be healthier. This result

was also consistent with the study of Tran Van Long showing that: antibiotic use behaviors of employees were better than farmers with OR = 1.49 and $p < 0.05$ [31]. This is consistent with Health Belief Model: having good knowledge, good attitude, practice will be better [32]. In addition, the results from this study also showed that the elderly who have been educated about antibiotics also use prescriptions more often than those who have never heard or not remember (OR = 3.99, 95%CI 2.57 - 6.22).

This study utilized the quantitative cross-sectional study design to describe the pattern of antibiotic usage among the elderly. However, it was conducted in a commune in a rural area in the Northern mountainous region of Vietnam. Therefore, the results from this study may not be generalized for the elderly in Vietnam. It is needed to conduct a larger-scale study and identify further characteristics of antibiotic usage such as types of antibiotics, frequency, etc. In addition, qualitative study design should be combined to achieve better understanding regarding antibiotic usage as well as barriers in antibiotic usage among the elderly.

Conclusion

The proportion of the elderly using antibiotics with a prescription was low. The majority of the participants bought antibiotics from the local private pharmacies. The main source of information to buy antibiotics was as the last time of antibiotic purchase and medicine sellers. After taking doses of antibiotics, if the symptoms did not release, the elderly tended to change to more expensive ones. A large proportion of participants stopped taking antibiotics after the symptoms were gone. Some factors significantly associated with prescription use were education level, ethnicity, obtained information related to antibiotic uses, individuals who buy the medicines.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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