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Evaluating attitudes, behaviors, and relevant factors in dispensing antibiotics without prescription by pharmacies: a cross-sectional study in Vietnam

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Key words: Pharmacy dispensers, dispensing antibiotics without prescription, community pharmacies

Parole chiave: Distribuzione dei farmaci, distribuzione degli antibiotici senza ricetta, farmacie comunali

Abstract

Objectives. *To standardize a questionnaire about drug dispensers' attitudes and behaviors in dispensing antibiotics without prescription, and to evaluate drug dispensers' attitudes, behaviors, and relevant factors in dispensing antibiotics without prescription at community pharmacies in Can Tho City, Vietnam.*

Methods. *A descriptive cross-sectional study was conducted among community pharmacists in Can Tho City, Vietnam from June to December 2022. A self-administered questionnaire designed according to the Theory of Planned Behavior was used for data collection. The questionnaire was composed of 33 statements scored on the 5-point Likert scale, which was completed by interviews with 180 pharmacy dispensers to Can Tho. Exploratory Factor Analysis was also utilized to uncover major determinants of dispensing antibiotics without prescription.*

Results. *Of the 180 participants, 65% of drug dispensers were female (n=117), 59.4% were university graduates (n= 107), and 80.6% had experience of less than 10 years (n=145). A pharmacy is the first destination people think about when they have a health issue. Unfortunately, dispensing antibiotics without a valid prescription is not in compliance with governmental regulations. In the study, perceived behavioral control factors were found to be the most critical determinants of the behavior, followed by subjective norms. By contrast, attitudinal factors presented no impact on intention to dispensing antibiotics without prescription.*

Conclusions. *The provision of non-prescription is primarily influenced by the perception of the distributors and external factors. Developing interventions is necessary to increase public awareness of the misuse and misunderstanding of antibiotics.*

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What we already know

If a Vietnamese citizen has a health problem, he will visit a drugstore/pharmacy first. In fact, it is illegal for a drug dispenser to deliver antibiotics to a patient without a valid prescription.

Antibiotic overuse is widely spread in Vietnam. This results in the growth of antimicrobial resistance , which is an emergency issue influencing the future of the healthcare industry.

What this article adds

This is one of the few studies to evaluate factors influencing dispensing antibiotics without prescription in Vietnam. To identify these factors, potential elements are taken into account.

The study findings provide a trustworthy reference for similar investigations in the future.

Abbreviations

A: Attitudes; AMR: Antimicrobial resistance; CPs: Community pharmacies; DAwP: Dispensing antibiotics without prescription; EFA: Exploratory Factor Analysis; ETC: Ethical drugs; GPP: Good Pharmacy Practices; I: Intention; K-S test: Kolmogorov-Smirnov statistic test; P: Practice; PBC: Perceived Behavioral Control; PDs: Pharmacy dispensers; SAQ: Self-administered questionnaire; SN: Subjective norms; TPB: Theory of Planned Behavior; WHA: The World Health Assembly

Introduction

In 2020, ethical drugs represented a majority of Vietnam's pharmaceutical industry (73%), dominating 27% of all over-the-counter products in total value. Pharmacies are often the first point of entry for Vietnamese patients into the healthcare system, as well as their favourite channel for drug procurement (1). Recently, adverse drug reactions in Vietnam have increased significantly, mostly due to unreasonable drug prescriptions (2). Although ETC drugs are only officially prescribed, previous studies showed an unprecedentedly high rate of illegal distribution of drugs (3). Antibiotics are one of the most important achievements of human beings, opening the era of using antibiotics to treat infections from micro-organisms. Antibiotics play a vital role in treatment, they offer many benefits and survivability to patients and are especially necessary for disease models in developing countries. According to the directives of the Ministry of Health, antibiotics constitute a special group for both patients and the community. For developing countries such as Vietnam, this is a large group of drugs because infectious diseases are one of the main diseases reported in both morbidity and mortality.

One of the most pressing public health concerns is the widespread irrational use and egregious misuse of antibiotics, posing a significant threat to AMR. The reason for this situation is the PDs are failing to practice their professionals with the long-term goal of strengthening and improving social health (4-6). Reviews have indicated that the provision and distribution of non-prescribed antibiotics are prevalent across developing regions (7). Furthermore, the number of available over-the-counter therapeutic items in pharmacies without a prescription is on the rise globally.

Prescription drug abuse and trafficking in non-prescription drugs have caused severe harm to patients and society, especially AMR. In 2015, the World Health Assembly adopted the WHA Resolution 68.7 on the global plan to prevent drug resistance, calling the Member States to implement the prevention of antibiotics resistance and invited international organizations to support the implementation of the plan.

Therefore the primary objective of this research is to find out factors having an influence as well as to quantify the

magnitude of the intention to DAwP of community pharmacists in Can Tho city, Vietnam in 2022.

Methods

1. Research methods

The research was a descriptive cross-sectional analysis, data were collected using a paper-and-pencil direct interview with PDs. The authors conducted direct interviews with sellers at random local pharmacies in 9 districts in Can Tho City. The list of 630 community drugstores and their addresses were provided by the Ministry of Health.

2. Sample size determination

The total number of CPs (1,111) in Can Tho city was provided by the Can Tho Department of Health. In accordance with the formula (Eq.1), the minimum required sample size for this analysis is n = 150. Nevertheless, in order to maximize the generalizability of the results, eventually, the interviewers finally decided to take a sample of 180 subjects.

3. Inclusion criteria

PDs in drug outlets, which were GPP-certified, activated at Can Tho city and voluntarily participating in the study.

4. Study design and settings

The research was conducted across nine districts in Can Tho City. The process of collecting data was carried out within six months, from June to December 2022.

The entire SAQ consisted of 33 items dealing with four areas of personal routine interventions. Questions within the interview were developed based on the "Theory of Planned Behavior" (TPB), which was first elaborated by Ajzen in 1991 (8). In short, this theory helped predict with a high degree of accuracy what the determinants of behavior were. Ajzen perceived three factors that accounted for the significant variation in behavior performance (Figure 1).

According to the TPB, people tend to engage in activities that they view as beneficial, are well-appreciated by those they consider important in society, and when they feel capable of performing the action, with little resistance (8). In other words, A, SN, and PBC are independent variables while Intention (I) is a dependent one.

On a 5-point Likert scale, responses to the inquiries were scored as specified:

1 = «strongly disagreed»; 2 = «disagreed»; 3 = «neutral»; 4 = «agreed»; and 5 = «strongly agreed».

The scale Intention to perform a given behavior (I) used 5-point Likert scale following:

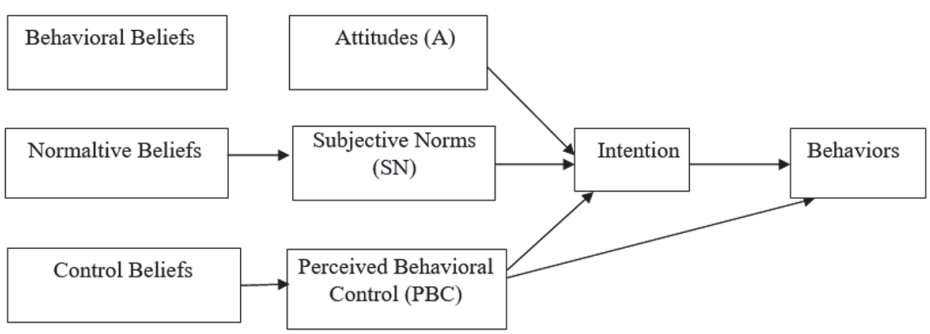

Figure 1 - Diagram of "Theory of Planned Behavior" (Ajzen, 1991).

- 1.0 – 1.8: strongly intentionless
- 1.81 – 2.6: intentionless
- 2.61 – 3.4: neutral
- 3.41 – 4.2: intention
- 4.21 – 5: strong intention

The survey consisted of three main sections: The first section described the characteristics of PDs (gender, age, professional degree, years of experience,…). The second section of the SAQ evaluating attitudes, and behavior relevant to DAwP of PDs comprised 27 questions divided into three parts: Attitudes (A) (9 items), Subjective Norms (SN) (10 items) and Practice (P) (8 items). The third section consisted of six questions surveying Intention (I) to perform a given behavior.

A pilot study was conducted at 10 local pharmacies. In addition, the researchers had direct discussion with pharmacy experts to standardize the content of the available survey. This allowed for the modification of the original questionnaire.

The interviews were audio recorded to ensure the accuracy of data. Some sensitive information was encoded for privacy and only used for scientific purposes.

5. Data analysis and quality assurance

The K-S test was used to verify whether the cumulative distribution of the I (Intention to dispense antibiotics without prescription) sample was a standard distribution (9).

Cronbach's alpha (also known as coefficient alpha α*),* was used to examine the scale's reliability.

High Cronbach's alpha was usually indicative of a high degree of internal consistency. The accepted value of α was closed to 0.70 and 0.95. The item-total correlations were adopted to access the internal consistency of the sub-scales (factors). A value greater than 0.3 was evidence of appropriate reliability (10, 11).

Exploratory Factor Analysis (EFA)

Conceptually, EFA was a fundamental tool in multivariate statistics for discovering and extracting latent attributes (potential underlying contributors) using a core components analysis and varimax rotation method (12).

After gathering data, Microsoft Excel 2013 and SPSS 20.0 were used for data analysis and storage. During the data collection, the research team verified the data validity and then cleaned them up with double-checks. Subsequently, the results were summarized in descriptive statistical tables (percentages and quantities).

6. Ethical considerations

The research was done following the guidelines in the Declaration of Helsinki. The study was approved by the Medical Ethics Council of the current institution (approval number 299/HDDD-PCT). A cover letter, which briefly outlined the purpose and ethics of the survey to beneficiaries, was also placed at the beginning of the SAQ. All participants gave their written informed consent prior to enrolling in this study.

Results

A total of 180 people working at pharmacies participated in the survey out of 225 visited drugstores (Response ratio = 80%).

Table 1 presents an apparent gender disparity. Of the 180 participants, a vast majority were female, which accounted for 65% compared to 35% of their male counterparts. The group of participants aged from 23 to 50 (90%) represented a greatly larger piece than the over-50-year-old group (10%). More than 50% of surveyed people graduated from medical university (59.4%), while graduates from colleges and intermediate medical schools (2-year training) occupied about 12.8% and 27.8% respectively. In terms of experienced level, over 80% of participants had been working in pharmacy stores for less than 10 years, whereas nearly 20% had more than 10 years of experience. Additionally, the study found

Table 1 - Participants' demographic characteristics

Features		Quantity (n)	Proportion (%)	Average Score	Standard Deviation	*p*-value
Gender	Male	63	35	0.84	0.12	0.817
	Female	117	65	0.82	0.16	
Age	23 – 50	162	90	0.83	0.15	0.524
	> 50	18	10	0.81	0.18	
Professional Degree	Bachelor	107	59.4	0.83	0.15	0.675
	College	23	12.8	0.83	0.14	
	Intermediate	50	27.8	0.83	0.15	
Years of experience	1-10	145	80.6	0.83	0.14	0.302
	11-20	29	16.1	0.81	0.19	
	> 20 years	6	3.3	0.80	0.21	
Role	Pharmacy's owner	97	53.9	0.81	0.18	0.552
	Employee	83	46.1	0.85	0.10	
Geographical Location	City	77	42.8	0.84	0.12	0.986
	Suburb	46	25.6	0.83	0.16	
	Countryside	57	31.6	0.81	0.17	

no statistical difference in the role of owners and employees (52.9% and 46.1%). Finally, urban participants made up 42.8%, which was greater than 25.6% in the suburbs and 31.6% in the countryside. Still, no statistical connection was observed in terms of all the abovementioned demographic traits at the CI of 95% (p>0.05).

1. Testing the reliability coefficient of variable scales by Cronbach's Alpha

Independent Variables

The variables of A1, A2, A3, SN5, SN8, SN9, SN10, P4, P8, and I4 were all removed due to violating conditions.

Summary

There were 18 items in the independent variables and five items in the dependent variables satisfying the condition. These items continued to undergo the EFA.

2. Exploratory Factor Analysis (EFA)

Explanatory independent variables

Overall, the total variance explained for over 70% (75.287%). Similarly, KMO valued was 0.846 ($0.5 \leq KMO \leq 1$). Therefore, three components extracted at Eigenvalue 2.434 (>1) were satisfying to continue the study. The researchers continue to conduct EFA on independent components' items. The result

Table 2 - Factor loading of items in measurement scales with independent variables of the final data set

Items	Component		
	1	2	3
P1. Almost no one can control the DAwP, or the control is very loose; therefore, selling antibiotics without prescription is very easy.	0.876		
P2. Monetary sanction is 1,000,000-5,000,000, which is easily affordable for drugstores.	0.929		
P3. I have sufficient knowledge to consult and dispense antibiotics for customers when necessary.	0.907		
P5. Pharmacies do not afraid to be penalized for DAwP.	0.884		
P6. Most customers visit drugstores without any prescriptions, so selling antibiotics with no prescription is unavoidable.	0.943		
P7. Some doctors will diagnose, make up a prescription, and sell antibiotics by themselves, so drugstores receive a limited number of prescriptions from patients.	0.911		
A4. Reducing treatment time will enhance the patients' belief in your drugstore.		0.844	
A5. It's convenience for patients who cannot visit a doctor.		0.800	
A6. Antibiotics have many side effects		0.817	
A7. Customers will not return if the drugstore does not dispense the antibiotics as their requests.		0.859	
A8. It is more and more difficult to develop new antibiotics.		0.836	
A9. DAwP could increase antibiotics resistance.	0.450	0.682	
SN1. Patients often do not oppose the drugstore selling antibiotics to them.			0.576
SN2. Patients request antibiotics to shorten treatment time.			0.880
SN3. DAwP is very popular, so it is normal for me to sell antibiotics.			0.907
SN4. No one opposes pharmacists selling antibiotics without prescription.			0.912
SN6. I am not afraid of being penalized for DAwP because my friends and family do not know it.			0.834
SN7. DAwP is mainly due to pressure from the owner on their employees.			0.635

showed that the total variance explained at the third component exceeded 1 (2.359), while the fourth component was less than 1 (0.776); hence, the extraction ended at the third component.

The result of Rotated Component Matrix – Independent variables: see Table 2.

The surveyed variables of the original three components converged to newly three components, which were unchanged. A9 was discarded because the subtraction of two components was less than 0.3. Furthermore, five variables of the attitude component converged on a new component. The trends of six variables of the subjective norm component and six variables of PBC were also similar to attitude component, where components' variables converged on new components and there was no need to rename them.

EFA Results

Therefore, all variables remaining from EFA satisfied the condition of factor loading greater than 0.5 (which means it has statistical significance).

EFA for Explanatory dependent variables

Basically, the KMO was around 0.763; the sig Bartlett's Test equaled 0.000; the value of Eigenvalue was about 2.976 (>1); and only one component was extracted. The total variance explained accounted for around 59.34% (>50%). Thus, the conditions were satisfying, and the study was carried out continuously with the intention component's

Table 3 - Factor loading of items in measurement scales with dependent variables of the final data set

Items	Component 1
I1. I will dispense antibiotics without prescription if the customer is an acquaintance.	0.611
I2. I will dispense antibiotics without prescription if the customer cannot visit a doctor.	0.882
I3. I will dispense antibiotics without prescription if the customer is also a healthcare professional.	0.829
I5. I will dispense antibiotics without prescription even though there is an observation-management camera.	0.899
I6. I will dispense antibiotics without prescription even if the monetary sanction is increased.	0.565

variables. The result showed that there was only one component with Eigenvalue at 1, so it remained at EFA.

The result of Rotated Component Matrix – Dependent variables: see Table 3**.**

The rotated component matrix resulted in three observation variables which converged into a group of components. All variables recorded factor loading greater than 0.5.

Based on the EFA, all of the items in the dependent variable converged to one component, so there was no need to change its name. With a factor loading of more than 0.5, the correlation between items and components was very close. In particular, I5 had the highest factor loading, at 0.899. It showed that there was the best correlation between variables and item I, which was different from I6 (factor loading = 0.565*).*

Table 4 presents that the attitude component did not affect the intention of DAwP p>0.05. The component of PBC showed the greatest influence. Whereas, the subjective norm presented the least impact with coefficient std. error around -0.395.

Table 4 shows that the attitude component towards DAwP should be eliminated due to not satisfying statistical significance (p-value > 0.05).

Significance level transforming from the average of Intention (I):

Kolmogorov – Smirnov Test: The result showed that the p-value was 0.000, so the data set was not a standard normal distribution. For that reason, the study used a nonparametric test to evaluate the differences in Intention (I) between qualitative variables.

Tables (S1-S8) and Figure (S1) for specific results of the survey are provided in *Supplemental Material.*

Discussion

A study carried in Sri Lanka by Zawahir et al (13) and another carried in Ethiopia by Ayana et al (14) using the same survey

Table 4 - The magnitude of the effect of a single factor on the intent to engage in given behavior

Model	Unstandardized		Coefficient Std. Error	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	1.972	0.229		8.600	0.000		
SNtb	-0.344	0.048	-0.395	-7.192	0.000	0.924	1.083
Atb	-0.014	0.048	0.016	0.296	0.767	0.933	1.083
Ptb	0.466	0.042	0.581	10.984	0.000	0.997	1.003

method both reported a quite high response ratio, 78% and 94.8%, respectively.

According to some characteristics of PDs, the study found an apparent gender disparity. 65% of the subjects were female, and only 35% males. Another study implemented in 2019 in Germany by Langer and Kunow also mentioned a considerable difference in gender distribution in the PDs community (15); and 90% of the PDs aged 23-50 presented a similar pattern to a study in Pakistan, where 56% of PDs were 30-50 years old (16). 59.4% of PDs graduated from universities, 27.8% from intermediate medical schools, and about 12.8% from colleges. The result was similar to the Siltrakool et al's study at Thai Lan in 2018 (17), which reported that 77.2% of pharmacists had bachelor'degrees. In terms of working experience, 80.6% of people had been working in pharmacy stores for 1 to 10 years, while this figure was about 16.1% for 11 to 20 years group, and only 3.3% got over 20 years of experience. Similarly, a cross-study carried out by Sarwar et al in 2018 (18) at Punjab, Pakistan, recorded a percentage of 89.5% PDs had under 10 years of experience; and the study of Siltrakool et al (17) also reported that 89.1% of PDs had less than 10 years of experience.

The proportion of pharmacy owners who directly distributed drugs to Can Tho City was recorded at 53.9%, while this percentage was 46.1% for their employees. A study conducted by Zawahir et al in 2018 (19) shows a different result, with 60.8% of PDs being employees. Moreover, 42.8% of pharmacy stores were located in urban areas, while 25.6% in suburb, and 31.6% in rural areas. The study by Kuang et al carried out in Guangzhou, China in 2020 (20) showed a similar result, with 68% of drugstores being situated in the city centers, while 32% of stores were located in the suburb .

The regression analysis showed that there was no association between the attitude variable and the act of DAwP. Thus the attitude component did not affect the act of DAwP in Can Tho City. The result was not similar to the study of Zawahir et al in Sri Lanka (21), which proved that the legal acknowledgement of DAwP and the knowledge of using and abusing antibiotics reduced the act of DAwP in the community. The study result was also different from the study of Mudenda et al in Zambia (22) and Roque et al in Portugal (23), which showed that 67.4% of PDs had a positive attitude toward antibiotic resistance. The present study results also differed from the study of Mansour et al in Syria (24) and the study of Roque et al in Portugal in 2015 (25): to be specific, these studies illustrated that most PDs had negative attitudes towards antibiotic resistance, thereby influencing on DAwP.

According to the standardized β value in the multivariable regression model, the component P (perceived behavioral control) mostly impacted on DAwP ($\beta = 0.581$). Therefore, PDs would possibly sell antibiotics with no prescription for the following reasons: almost no one can control the DAwP, or the control is loose; dispensers had sufficient knowledge to consult and dispense antibiotics for customers when necessary; pharmacies were not afraid to be penalized for DAwP; most customers visited drugstores without any prescriptions, so selling antibiotics with no prescription was somehow unavoidable; some doctors would diagnose, write a prescription, and sell antibiotics, so drugstores received a limited number of prescriptions.

The study shared some common points with the study by Vazquez-Lago et al in 2017 (26) and the result of Zapata-Cachafeiro et al in 2013 (27) in Spain to a certain degree. To be more specific, the component affecting DAwP in Spain were the external healthcare professionals, which corresponded to the subjective norm component in the current study. However, there was a difference in the studies' elements. The study conducted by Vazquez-Lago et al (26) mentioned

the influence of doctors and dentists on PDs' behaviors, while this study mainly focused on the influence of the owner, other dispensers, and the pressure on their own income.

The results of this study were not similar to the study of Zawahir et al in Sri Lanka in 2021 (13). Specifically, DAwP was related to dispensers' belief in the effectiveness of antibiotics and their own professional capacity. The dispensers who believed in the effective treatment of antibiotics against popular infections would possibly provide antibiotics without prescription.

The study found that the intention of DAwP came from the benefits of individuals and pharmacy stores. The explanation for this included: customers would not return if drugstores did not dispense antibiotics as their request; this influenced the income of stores, thereby enhancing pressure from the owners on their employees. This result showed similarities to the study of Dameh in New Zealand (28) and the study of NTT conducted in the north of Vietnam (29), which proved that financial pressure was the main reason of DAwP. Furthermore, the general public did not oppose the drugstore selling antibiotics to them; no one opposes pharmacists selling antibiotics without prescription; and the confidence in pharmacists' capacity in DAwP ("I have sufficient knowledge to consult and dispense antibiotics for customers when necessary") were presented in Likert Scale in which level 4 accounted for the largest proportions at 50.0%; 38.3%; 45.0%. This proved that the belief of customers in PDs was powerful. The study of Belachew et al carried out in 2021 (30), regarding reasons for DAwP among pharmacy retailers in low to middle-income countries, also showed a similar pattern, illustrating the mutual impact of professional component and business interests. This study shared a similarity in the reason for promoting DAwP in some degree with the research of Abdelrahman Hussain et al. in 2022 (31), where pharmacists obtained enough knowledge to dispense antibiotics without prescription (47%), losing customers, pressure from the pharmacy owner, etc. However, this study showed the patients' belief on pharmacists as the main component, whereas the study in Sudan reasoned on low income patients.

The overuse of antibiotics in the community was spreading widely in Viet Nam, resulting in the AMR, which is an urgent issue and affects the future of healthcare industry (32).

Strengths and Limitations

Face-to-face interview is the major technique of data collecting stage. Despite some typical drawbacks such as social desirability bias, characteristics of both interviewers and respondents, there is no doubt that this method is a powerful and popular tool in research. Plus, the data collection was carried out in a quite long period (6 months) due to the spread of COVID-19 pandemic. This could be another limitation of the research, as it might result in recruiting imbalance and the effects of COVID-19 on both selected pharmacists and prolonged investigation. The impacts of these factors have not been considered as well.

Conclusion

The data set shows that the characteristics (gender, age, experience, etc.) are not statistically associated with the identified problem. The attitudes of PDs do not affect the behaviors of DAwP. These are the reasons leading to a steady increase in AMR in the community. More multifaceted collaborations and efforts should be made to enhance community pharmacists' skills and performances. In addition, people should be more aware of AMR as well as misuse and misunderstanding of antibiotics.

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Data availability: The data that support the findings of this study are available from the corresponding author Hung Phuc Nguyen (i.e. upon reasonable request).

Riassunto

Valutazione degli atteggiamenti, comportamenti e fattori rilevanti nella distribuzione senza ricetta di antibiotici nelle farmacie: uno studio trasversale in Vietnam

Obiettivo. Standardizzare un questionario sugli atteggiamenti e i comportamenti dei distributori di farmaci nella fornitura di antibiotici senza prescrizione medica e valutare gli atteggiamenti, i comportamenti e i fattori rilevanti dei distributori di farmaci nella fornitura di antibiotici senza prescrizione presso le farmacie della città dia Can Tho, Vietnam.

Metodi. Uno studio trasversale descrittivo è stato condotto tra i farmacisti della città di Can Tho, Vietnam, tra Giugno e Dicembre 2022. Per la raccolta dei dati è stato utilizzato un questionario autosomministrato progettato secondo la «teoria del comportamento pianificato». Il questionario era composto da 33 quesiti valutati sulla scala Likert a 5 punti, ed era completato da interviste a 180 distributori di farmaci a Can Tho. L'analisi fattoriale esplorativa è stata utilizzata anche per identificare i principali determinanti della somministrazione di antibiotici senza prescrizione medica.

Risultati. Dei 180 partecipanti, il 65% erano donne (n=117), il 59,4% possedevano una laurea (n= 107) e l'80,6% (n=145) aveva un'esperienza laorativa inferiore a 10 anni. La farmacia è il primo luogo a cui le persone pensano quando hanno un problema di salute. Sfortunatamente, distribuire antibiotici senza una prescrizione valida non è conforme alle norme governative. Nello studio, i fattori di controllo comportamentale percepito sono risultati essere i determinanti più critici del comportamento, seguiti dalle norme soggettive. Al contrario, i fattori attitudinali non hanno avuto alcun impatto sull'intenzione di dispensare antibiotici senza prescrizione medica.

Conclusioni. La fornitura di prodotti non soggetti a prescrizione è principalmente influenzata dalla percezione dei distributori e da fattori esterni. Lo sviluppo di interventi è necessario per aumentare la consapevolezza pubblica sull'uso improprio e sull'ignoranza diffusa circa il corretto uso degli antibiotici.

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SUPPLEMENTAL MATERIALS

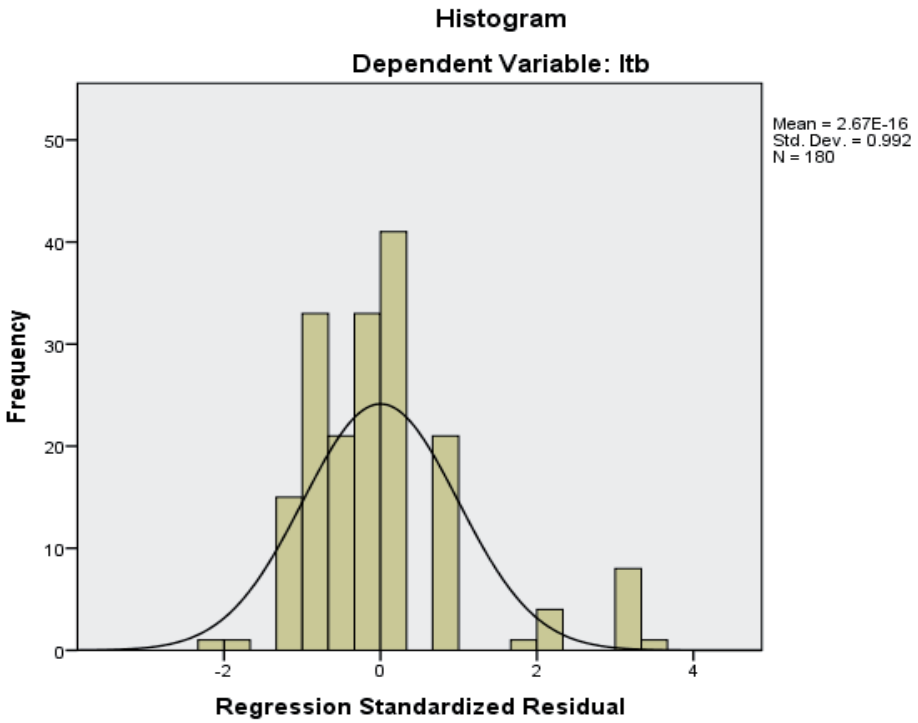

Figure S1 - Regression Standardized Residual – Intention

Table S1 -The attitude of pharmacy dispensers towards dispensing antibiotics without prescription.

Items	Average Score	Standard Deviation	Proportion [n (%)]				
			Level 1	Level 2	Level 3	Level 4	Level 5
The attitude of pharmacy dispensers							
A4	3.71	0.86	3 (1.7)	11 (6.1)	48 (26.7)	91 (50.1)	27 (15)
A5	3.64	0.84	5 (2.8)	10 (5.6)	48 (26.7)	99 (55)	18 (10)
A6	3.67	0.88	4 (2.2)	12 (6.7)	48 (26.7)	91 (50.6)	25 (13.9)
A7	3.74	0.89	5 (2.8)	10 (5.6)	40 (22.2)	96 (53.3)	29 (16.1)
A8	3.71	0.92	6 (3.3)	11 (6.1)	41 (22.8)	94 (52.2)	28 (15.6)

Explanatory notes: A4. Reducing treatment time will enhance the patients' belief in your drugstore; A5. It's convenience for patients who cannot visit a doctor; A6. Antibiotics have many side effects; A7. Customers will not return if the drugstore does not dispense the antibiotics as their requests; A8. It is more and more difficult to develop new antibiotics

Table S2 - The subjective norm of pharmacy dispensers on dispensing antibiotics without prescription.

Items	Average Score	Standard Deviation	Proportion [n (%)]				
			Level 1	Level 2	Level 3	Level 4	Level 5
SN1	3.59	0.93	6 (3.3)	16 (8.9)	46 (25.6)	90 (50)	22 (12.2)
SN2	3.32	1.08	7 (3.9)	42 (23.3)	38 (21.1)	72 (40)	21 (11.7)
SN3	3.04	1.13	11 (6.1)	60 (33.3)	37 (20.6)	54 (30)	18 (10)
SN4	3.12	1.12	12 (6.7)	52 (28.9)	33 (18.3)	69 (38.3)	14
SN6	3.06	1.07	9 (5)	59 (32.7)	36 (20)	64 (35.6)	12 (6.7)
SN7	3.24	1.17	10 (5.6)	48 (26.7)	37 (20.6)	58 (32.2)	27 (15)

Explanatory notes: SN1: Patients often do not oppose the drugstore selling antibiotics to them; SN2: Patients request antibiotics to shorten treatment time; N3. DAwP is very popular, so it is normal for me to sell antibiotics; N4. No one opposes pharmacists selling antibiotics without prescription; SN6. I am not afraid of being penalized for DAwP because my friends and family do not know it; SN7. DAwP mainly due to pressure from the owner on their employees.

Table S3 - The perceived behavioral control of pharmacy dispensers over dispensing antibiotics without prescription.

Items	Average Score	Standard Deviation	Proportion [n (%)]				
			Level 1	Level 2	Level 3	Level 4	Level 5
P1	3.38	0.85	4 (2.2)	22 (12.2)	65 (36.1)	79 (43.9)	10 (5.6)
P2	3.38	0.84	4 (2.2)	22 (12.2)	63 (35)	83 (41.6)	8 (4.4)
P3	3.37	0.89	6 (3.3)	22 (12.2)	61 (33.9)	81 (45)	10 (5.6)
P5	3.31	0.88	4 (2.2)	29 (16.1)	65 (36.1)	72 (40)	10 (5.6)
P6	3.41	0.85	2 (1.1)	25 (13.9)	63 (35)	78 (43.3)	12 (6.7)
P7	3.32	0.87	2 (1.1)	33 (18.3)	61 (33.9)		

Explanatory notes: P1: Almost no one can control the DAwP, or the control is very loose; therefore, selling antibiotics without prescription is very easy; P2: Monetary sanction is 1,000,000-5,000,000, which is easily affordable for drugstores; P3: I have sufficient knowledge to consult and dispense antibiotics for customers when necessary; P5: Pharmacies do not afraid to be penalized for DAwP; P6: Most customers visit drugstores without any prescriptions, so selling antibiotics with no prescription is unavoidable; P7: Some doctors will diagnose, make up a prescription, and sell antibiotics by themselves, so drugstores receive a limited number of prescriptions from patients.

Table S4 - The intention of pharmacy dispensers to dispense antibiotics without prescription.

Items	Average Score	Standard Deviation	Proportion [n (%)]				
			Level 1	Level 2	Level 3	Level 4	Level 5
I1	2.74	0.98	12 (6.7)	76 (42.2)	40 (22.2)	50 (27.8)	2 (1.1)
I2	2.19	0.74	20 (11.1)	120 (66.7)	25 (13.9)	15 (8.3)	0 (0.0)
I3	2.32	0.87	22 (12.2)	104 (57.8)	28 (15.6)	26 (14.4)	0 (0.0)
I5	2.27	0.75	16 (8.9)	115 (63.9)	34 (18.9)	14 (7.8)	1 (0.6)
I6	2.67	1.09	12 (6.7)	90 (50)	45 (25)	12 (6.7)	21 (11.7)

Explanatory notes: I1. I will dispense antibiotics without prescription if the customer is an acquaintance.
I2. I will dispense antibiotics without prescription if the customer cannot visit a doctor.
I3. I will dispense antibiotics without prescription if the customer is also a health care professional.
I5. I will dispense antibiotics without prescription even though there is an observation-management camera.
I6. I will dispense antibiotics without prescription even if the monetary sanction is increased.

Table S5 -. The reliability of the attitude variable in dispensing antibiotic without prescription (DAwP)

Item – Total Statistics		
Items	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
A1. Dispensing antibiotic boosts pharmacies' income	0.396	0.888
A2. Dispensing antibiotics saves a great amount of money and time for patients	0.375	0.889
A3. Antibiotics quickly reduce disease symptoms in mild bacterial infections.	0.465	0.882
A4. Reducing treatment time will enhance the patients' belief in your drugstore.	0.811	0.852
A5. It's convenience for patients who cannot visit a doctor.	0.736	0.859
A6. Antibiotics have many side effects.	0.787	0.854
A7. Customers will not return if the drugstore does not dispense the antibiotics as their requests.	0.741	0.858
A8. It is more and more difficult to develop new antibiotics.	0.685	0.863
A9. DAwP could increase antibiotics resistance.	0.694	0.863
Cronbach's Alpha (CA): 0.881		

Table S6 - The reliability in the subjective norm variable in dispensing antibiotic without prescription

Item – Total Statistics		
Items	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
SN1. Patients often do not oppose the drugstore selling antibiotics to them.	0.493	0.770
SN2. Patients request antibiotics to shorten the treatment time.	0.758	0.735
SN3. DAwP is very popular, so it is normal for me to sell antibiotics.	0.777	0.730
SN4. No one opposes pharmacists selling antibiotics without prescription.	0.801	0.727
SN5. Doctors also make up prescriptions with antibiotics to treat several diseases, and I also learn from them to sell antibiotics to patients.	0.282	0.794
SN6. I am not afraid of being penalized for DAwP because my friends and family do not know it.	0.641	0.751
SN7. DAwP is mainly due to pressure from the owner on their employees.	0.489	0.770
SN8. My teachers often give me advice about not selling antibiotics without prescription.	0.176	0.805
SN9. Foremost experts do not encourage DAwP.	0.071	0.814
SN10. The media attention on DAwP is steady increased.	0.155	0.807
Cronbach's Alpha (CA): 0.791		

Table S7 - The reliability in the Perceived Behavioral Control variable on dispensing antibiotics without prescription (DAwP)

Item – Total Statistics		
Items	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
P1. Almost no one can control the DAwP, or the control is very loose; therefore, selling antibiotics without prescription is very easy.	0.860	0.908
P2. Monetary sanction is 1,000,000-5,000,000, which is easily affordable for drugstores.	0.918	0.904
P3. I have sufficient knowledge to consult and dispense antibiotics for customers when necessary.	0.866	0.907
P4. I have sufficient experience to select suitable antibiotics for customers, which ensures safety and efficiency.	0.535	0.936
P5. Pharmacies do not afraid to be penalized for DAwP.	0.812	0.911
P6. Most customers visit drugstores without any prescriptions, so selling antibiotics with no prescription is unavoidable.	0.915	0.904
P7. Some doctors will diagnose, make up a prescription, and sell antibiotics by themselves, so drugstores receive a limited number of prescriptions from patients.	0.880	0.906
P8. The general public's habit which prefers not visiting doctors.	0.333	0.947
Cronbach's Alpha (CA): 0.926		

Table S8 - The reliability in the Intention variable in dispensing antibiotic without prescription (DAwP)

Item – Total Statistics		
Items	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
I1. I will dispense antibiotics without prescription if the customer is an acquaintance.	0.474	0.701
I2. I will dispense antibiotics without prescription if the customer cannot visit a doctor.	0.705	0.647
I3. I will dispense antibiotics without prescription if the customer is also a health care professional.	0.644	0.651
I4. I will dispense antibiotics without prescription when I believe that health care inspectors do not inspect my drugstore.	0.124	0.790
I5. I will dispense antibiotics without prescription even though there is an observation-management camera.	0.732	0.638
I6. I will dispense antibiotics without prescription even if the monetary sanction is increased.	0.430	0.715
Cronbach's Alpha (CA): 0.738		