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Drug Resistance Knowledge and Anti Drug Resistance Behavior among high school students in Phangnga Province, Thailand

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Abstract

Background: Currently, there are approximately 40,000 deaths a year from drug resistance infections. This is caused by improper use of antibiotics, intermittent and dosage lower than therapeutic until the drug resistant bacteria can develop resistance to antibiotics on their own.

Purpose: To assess level of drug resistance knowledge and anti drug resistance behavior.

Methodology: A cross sectional observational study was conducted. 331 students participated in the study. Drug resistance related knowledge and anti drug resistance behavior was assessed. Differences between outcomes and sociodemographic were analyzed through independent t-test, ANOVA.A generalized linear model was calculated to determine the predictive variables of anti drug resistance behaviors.

Findings: Participants revealed a low level of knowledge of drug resistance and a moderate level of drug resistance preventive behaviors. Factors influenced drug resistance preventive behaviors among participants were knowledge about drug resistance and their gender. Both of which had a positive correlation with drug resistance preventive behaviors. Knowledge about drug resistance was an influential factor in predicting drug resistance preventive behaviors.

Conclusion: Participants had a low level of knowledge about drug resistance. Drug resistance knowledge should be educated more to enhance drug resistance prevention among high school students

Keywords: drug resistance, antibiotic resistance, anti drug resistance

Introduction

Drug resistance is a condition in which bacteria become resistant to antibiotics. The treatment of infected patients was not as effective as before. It might take longer to heal, cost more for treatment or the patient might have a higher risk of death [1]. The symptoms of drug resistance infection can be observed when we take the same drug and do not recover from the disease. Because bacteria will adapt and develop themselves into a superbug that is resistant to drugs and difficult to find cures. The drug resistance bacteria are caused by inappropriate use of antibiotics, intermittently, and the dose is lower than the parallel treatment until the resistance bacteria can develop resistance to antibiotics on their own. Can occur with all types of infections depending on how much or how little in each infection including the misuse of antibiotics [2]The world currently has an estimated 700,000 deaths per year from drug resistance infections because there is still no cure for drug resistance infections. In addition, it is still not possible to cultivate people to use antibiotics correctly enough, and it is estimated that by 2050 the death toll from drug resistant bacteria will reach 10 million people. Asian countries will have the most deaths. is 4.7 million people, representing an economic impact of about 3.5 billion baht. For Thailand, the total economic loss is as high as 42 billion baht. If including indirect costs arising from

premature mortality and morbidity at an age that is still able to work productively, economic losses. From drug resistance bacteria will be worth more than 5,000 million baht per year. Therefore, it is necessary to solve the problem of drug resistance infections as quickly as possible. [3]

Currently, in Thailand, the number of deaths from drug resistance infections is approximately 40,000 per year. Drug resistance infections result in more deaths every year. Because there is no drug of any kind that can inhibit drug resistance pathogens. The main cause of drug resistance infections is the misuse of antibiotics. Because people lack knowledge and deep understanding such as the fact that people do not know whether the disease is actually infectious or not. If it is an infectious disease, it is not known whether the disease is caused by a virus or bacteria. And if it's a bacteria, they don't know what kind of bacteria it is. Or even knowing the type of bacteria but there is still a lack of knowledge about which antibiotic should be used in order to be effective and safe for the body and also lack of knowledge about drug dosage frequency of drug use and duration of treatment [4] and most people have misconceptions about antibiotics, for example, antibiotics are often referred to as anti-inflammatory drugs. It is often thought that antibiotics can cure all underlying ailments. And often thought that any type of antibiotic will kill all types of bacteria. Or even the use of antibiotics in farm animals. Because Thailand does not have a system to monitor the use and distribution of antibiotics systematically. Therefore, there are many farmers who go to buy antibiotic drugs from the market such as amoxicillin, streptomycin and then use them in animals and plants. The antibiotic is added to the animal feed because it is believed that the drug will prevent the animal from getting sick and causing the animal to grow faster and bigger. It is also used as an injectable mixture in plants because it is believed that the plant will grow faster without insects to eat it. But in fact, It is an antibiotic drug that people take and must be used with caution because if the resistance bacteria originated from animals drug resistance bacteria may also be transmitted from animals to humans.[5] Drug resistance bacteria are more likely to infect hospitals than in other places because drug resistance bacteria can be spread by touching, coughing, sneezing, or can be infected by contaminated equipment in hospitals. Therefore, it is imperative to wash your hands properly after doing activities such as after going to the bathroom or before eating to prevent the body from being contaminated with infection. [6]

In this study, the researcher is interested in assessing the knowledge about drug resistance and the anti drug resistance behavior among high school students, Deebuk PhangNga Wittayayon School that there is a level of drug resistance related knowledge and anti drug resistance behavior. It is expected that the results of the research can be used as a guideline to promote better antibiotic use behavior. This will help affect the health and hygiene of students. It also reduces the economic bad effect and time spent on medical treatment for staff due to the misbehavior of antibiotic use among students.

Methods

Participants and procedure

This was a cross-sectional observational study. An online questionnaire has purposely developed an mead available through Google From between 1 September 2021 and 13 September 2021 All students were eligible and were invited to participate in the study. The invitation was sent to the school‘s social media groups. The students have access to school social media groups, so they all receive an invitation. In this invitation, information about the objectives of the study as well as the ethical guarantee of confidentiality and anonymity in the data collected as stated in the informed consent was explained. Participation was completely free and voluntary, and no personal data were collected from any participant. Of the 826 students, a total of 331 students participated in the study (response rate: 40.07%).

Instrument

The questionnaire was developed based on a literature review including (1) What is drug resistance, drug resistance symptoms, what causes drug resistance, what is multidrug resistance, drug resistance infections in animals, spread of drug resistance, how to prevent drug resistance infections, antibiotic use behavior, and the effects of drug resistance CDC (2) studies performed on the same topic were several common items were used to assess each of the dimensions analyzed in this study. The proposed items were then grouped and redundant items were removed.

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A preliminary version of the instrument was reviewed by three experts to validate its content. A pretest was then performed with a small sample of grade 10-12 students at nearby schools to test for comprehension and difficulty. All the questions remained without modifications. The psychometric characteristics of the questionnaire were tested, as described in the statistical analysis subsection.

The final version of the questionnaire contained 31 questions; 6 about the sociodemographic date (gender, age, education level, study program, parent occupations, Number time of hospitalized, Instruction from doctors or pharmacists) and 25 items divided into 2 sections

Knowledge about drug resistance: this scale consisted of 15 questions related to causes of drug resistance, the spread of drug resistance, the place at risk for drug resistance infections, and knowledge about antibiotic use. The participants were asked to choose the correct answer from multiple choices of 4. One point was assigned to each correct answer while providing an incorrect answer received zero points. The sum of all items was made hence higher scores corresponded to a higher level of knowledge.

Anti drug resistance behavior: these scales referred to the number of preventive behaviors adopted and included 10 items (prevention of drug resistance, maintaining hygiene, hand washing, social distancing, and antibiotic drug behavior) The data analysis reports to 10 items. Each item was answered using a five-point scale (From 1-Never to 5-Always), with one point assigned to each behavior that was always practiced. The number of behaviors practiced was added up. A high score on this scale indicated good preventive behaviors, ranging from 10 to 50.

Statistical analysis

The analysis was performed using SPSS for windows, version 26. To analyse psychometric characteristics of the scales, an exploratory factor analysis, using principal component analysis with varimax rotation, was carried out. Reliability was analyzed through the calculation of item-total correlation coefficients and Cronbach's alpha (α) for the scales of the questionnaire. The descriptive analysis were presented in absolute (n) and relative (%) frequencies, mean (M) and standard deviations (SD). To assess the differences between the outcome variables (Knowledge about drug resistance and anti drug resistance behaviors) and the sociodemographic characteristics, considering the sample size, independent t-test and the ANOVA were used as appropriate. The correlations between the outcomes of the study were calculated by Pearson's correlation. Lastly, a generalized linear model was calculated to determine the predictive variables of the preventive behaviors. Exp (β) and the respective 95% confidence intervals (95% IC) were presented. Statistical significance was defined as $p < 0.05$.

Ethical Considerations

This research had been approved by the school. This research uses an anonymous data collection method to collect data from high school students of Deebuk Phangnga Wittayayon School, Phangnga Province, Thailand, by using Google form. The invitation was sent to the school 's social media groups. In these invitations, information about the study's objectives and the ethical guarantee of confidentiality and anonymity in the data collected as stated in the informed consent was explained. Participation was completely free and voluntary, and no personal data were collected from any participant.

Result

This study comprised a total of 331 students.The sociodemographic characteristics of the sample are presented in Table 1. Most students were female (n=232, 70.1%). Most students were grade 11 (n=126, 38.1%) followed by grade 10 (n=105, 31.7%) and grade 12 (n=100 , 30.2%) respectively. Most students' study programs were Science-Mathematics (n=274, 82.8%) followed by English-Mathematics (n=32, 9.7%) and Chinese- Arts (n=25, 7.6%) respectively. Most students parent occupations were freelance (n=160 , 48.3%) followed by business owner (n=56 , 16.9%) , government official (n=50, 15.1%) , Others occupations (n=43, 13%) and health care workers or teachers (n=22, 6.6%) respectively. Most hospitalized were 0-2 times/year (n=277, 83.7%) followed by 3-5 times/year (n=41, 12.4%) and above 5 times/year (n=13, 3.9%) respectively. And 169 (51.1%) of the students never have instruction from doctors or pharmacists while the rest ever have instruction from doctor or pharmacy (n=162, 48.9%).

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Regarding knowledge and understanding about drug resistance, students revealed low knowledge and understanding about drug resistance, correctly answering mean of 8.34 (SD=1.78) questions in a total of 15. Female students showed higher knowledge and understanding about drug resistance scores (M=8.49, SD=1.74) than male students (M=8.00, SD=1.85). Students in grade 11 showed the highest drug resistance related knowledge and understanding score of 8.41 (SD=1.74), Students who study Chinese- Arts study program showed the highest drug resistance related knowledge and understanding score of 8.88 (SD=1.69). Students whose parents were health care workers or Teachers showed the highest drug resistance related knowledge and understanding score of 8.64 (SD=2.17). Students who were hospitalized 0-2 times/years showed the highest drug resistance related knowledge and understanding score of 8.38 (SD=1.77). Students who ever had instruction from doctors or pharmacists showed the highest drug resistance related knowledge and understanding score of 8.37 (SD=1.53).

Students showed moderate levels of prevention toward behavior anti-drug resistance with an average score of 38.90 from 50 full scores. Female students showed higher scores of prevention anti-drug resistance behavior (M=39.59, SD=5.30) than male students (M=37.29, SD=5.89). Students in grade 11 showed the highest scores of prevention anti-drug resistance behavior of 39.41 (SD=4.85), Students who study Chinese- Arts study program showed the highest scores of prevention anti-drug resistance behavior of 41.04 (SD=5.71). Students whose parents were freelance showed the highest scores of prevention anti-drug resistance behavior of 39.33 (SD=5.39). Students who were hospitalized 3-5 times/year showed the highest scores of prevention anti-drug resistance behavior of 39.00 (SD=6.67). Students who never had instruction from doctors or pharmacists showed the highest scores of prevention anti-drug resistance behavior of 39.14 (SD=5.89).

Table 1.

Differences in outcomes according to the sociodemographic characteristics of participants (N = 331)

Sociodemographic characteristics	N (%)	Drug resistance Knowledge & Understanding (Range 0-15) M (SD)	Anti Drug Resistance Behavior (Range 10-50) M (SD)
Gender			
Male	99 (29.9)	8.00 (1.85)	37.29 (5.89)
Female	232 (70.1)	8.49 (1.74)	39.59 (5.30)
Class Level			
Grade 10	105 (31.7)	8.23 (1.78)	38.72 (5.83)
Grade 11	126 (38.1)	8.41 (1.74)	39.41 (4.85)

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Grade 12	100 (30.2)	8.38 (1.84)	38.44 (6.12)
Study Program			
Science-Mathematics	274 (82.8)	8.37 (1.80)	38.67 (5.61)
English-Mathematics	32 (9.7)	7.75 (1.59)	39.22 (4.84)
Chinese-Arts	25 (7.6)	8.88 (1.69)	41.04 (5.71)
Parent Occupation			
Health care workers or Teacher	22 (6.6)	8.64 (2.17)	38.32 (5.01)
Business owner	56 (16.9)	8.63 (1.54)	38.59 (6.41)
Government official	50 (15.1)	8.08 (1.79)	37.80 (5.71)
Freelance	160 (48.3)	8.31 (1.84)	39.33 (5.39)
Others	43 (13)	8.28 (1.64)	39.28 (5.19)
Number time of hospitalized			
0-2 times/year	277 (83.7)	8.38 (1.77)	38.93 (5.40)
3-5 times/year	41 (12.4)	8.17 (1.87)	39.00 (6.67)
Above 5 times/year	13 (3.9)	8.15 (1.82)	37.92 (5.87)
Instruction from doctors or Pharmacists			
Yes	162 (48.9)	8.37 (1.53)	38.65 (5.23)
No	169 (51.1)	8.32 (2.00)	39.14 (5.89)
Total	331 (100)	8.34 (1.78)	38.90 (5.57)

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The analysis of the corrections between the outcomes of the study - knowledge & understanding and behavior - revealed the existence of positive and statistically significant correlations between anti drug resistance behavior and Knowledge & Understanding related to drug resistance (r=.262**, p<0.01). (Table 2.)

Table 2. Pearson's correlation coefficient between the study outcomes

Variables	Drug Resistance Knowledge & Understanding	Anti Drug Resistance Behavior
Drug resistance Knowledge & Understanding	1	
Anti Drug Resistance Behavior	.262**	1
**Correlation is significant at the 0.01 *Correlation is significant at the 0.05		

Results from the generalized linear model indicated that drug resistance knowledge & understanding (Beta=.249, p<0.01) and gender of students (Beta=.133, p<0.01) had a statistically significant effect on Anti-Drug Resistance Preventive Behavior adopted. (Table 3.)

Table 3. Generalized linear model predicting anti drug resistance behavior

	B	SE	EXP (β)	Sig (p)	95% CI	
					Lower	Upper
Gender	1.620	.660	.133	.015	.322	2.917
Class Level	-.230	.381	-.033	.546	-.980	.520
Study Program	.841	.520	.088	.107	-.183	1.865
Parent Occupation	.372	.264	.075	.159	-.147	.892
Number time of hospitalized	-.042	.599	-.004	.944	-1.221	1.137
Instruction from Doctor or Pharmacists	.494	.587	.044	.400	-.661	1.649
Drug resistance	.778	.167	.249	.000	.451	1.106

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Knowledge & Understanding						

Discussion

From the study of knowledge and anti drug resistance prevention behaviors of students in high school students of Deebuk Phangnga Wittayayon School, It was found that most of the students had low knowledge about drug resistant bacteria and antibiotics. This could be attributed to the fact that drug resistance wasn't academic context knowledge that was taught in school and people who had high levels of knowledge about drug resistance were healthcare workers who were educated on this matter and consumers who had experience using antibiotics.[7] Together with the students of Deebuk Phangnga Wittayayon School, It was a group that had not received any training on drug resistance before. Most students did not know that drug-resistance bacteria were contagious from touching, coughing, sneezing, unaware that drug resistance bacteria did not have drugs that can be cured of the disease. And there was a perception that expensive antibiotics were more effective than cheap one. The students had moderate anti drug resistance behavior, because students listened and followed instructions of antibiotic use from their parents or what was being taught, therefore students revealed moderate scores of antibiotic use behavior. This was consistent to Tawan Petpaiboon 's study that high school students had a moderate preventive behaviors as well as level of knowledge. [8] Female students showed a higher level of knowledge and the prevention behaviors of drug resistance than the male students. This may be because being female paid more attention to details than males. As for students in grade 11, they had the highest level of knowledge and preventive behaviors among other classes while grade 12 were showing the lowest scores. This could be attributed to grade 12 students needed to focus on their studies and to prepare for university entrance exams so they did not pay attention to mostly anything besides exam preparation. The students in the Chinese-Arts study program had the highest level of knowledge and preventive behaviors among other programs due to Chinese-Arts program was less concentrated than other programs hench Chinese-Art program students had more time to focus on other matter than academic, this finding was contrast to Supakarn Vathanakitanond et al. 's [9] that science program students were having higher knowledge, attitude and preventive behaviors toward pathogen spreading. For students with parents pursuing occupations in health science and education, the knowledge of drug resistance bacteria and antibiotics was higher than those whose parents were working in other occupations. Because parents who were healthcare workers could educate their children how to properly use antibiotics, this attributed to a higher level of knowledge and understanding regarding drug resistance than students whose parents worked in other fields. From the study there was a positive correlation relationship between knowledge and understanding about drug resistance and anti drug resistance behavior ($r=.262^{**}$, $p<0.01$), moreover the generalized linear model analysis showed that knowledge and understanding about drug resistance (Beta=.249, $p<0.01$) and gender (Beta=.133, $p<0.01$) were predictive factors for antibiotics behavior adopted. This finding can be information for policy makers to plan for a health education program for high school students to prevent drug resistance problems by providing health education regarding this issue.

Jidapa Ratanathworn [10] conducted a study about influencing factors of drug resistance preventive behavior of grade 10-12 students in Bangkok and found that most students had a high level of knowledge about drug resistance bacteria and antibiotics and a high level of Anti Drug Resistance Behavior, because Bangkok was an urban society, students who studied in Bangkok were eager to learn because there had an appropriate environment for education, therefore there was high competition in education. Different from Phang Nga, which was a rural society that hadn't an educational competition as high as Bangkok. Worraprat Wuttisan [11] conducted a study about Knowledge, attitude, and drug resistant preventive behavior of university students: A study among university students in Chonburi, Thailand and found that university students had a moderate knowledge and understanding of drug resistance, a high attitude toward preventive behavior and a high preventive behavior toward drug resistance and found university students studying in the Social Science

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faculty had the highest level of knowledge and understanding of drug resistance. Because they learned about drug resistant bacteria, As a result, the students studying in this faculty had a high level of attitude toward preventive behavior and preventive behavior toward drug resistance. Sujimon Mungkalarungsi et al. [7] conducted a study about knowledge, attitude, and drug resistance preventive behavior among Thai people:A cross-sectional online study in Thailand and found that participants had a moderate level of knowledge on drug resistance , a high level of attitude toward drug resistance preventive behavior, a moderate level of drug resistance preventive behaviors and found participants aged 41-50 had the highest level of knowledge on drug resistance because they had experience with drug resistance. As a result, they had a high level of attitude toward drug resistance prevention, but had moderate behavior because they had a moderate level of knowledge on drug resistance. Nannapas Tonginta and Sujimon Mungkalarungsi [12] conducted a study about factors influencing drug resistance preventive behavior of high school teachers in Bangkok and found that teachers from Satriwithaya school had a low level of knowledge about drug resistance,a high level of attitudes towards the prevention of drug resistance infections, and a high level of drug resistance preventive behavior because teachers were responsible for teaching students to behave in the right way. Therefore, teachers had to act as a good example for students.

Limitation

The study was conducted during the COVID-19 pandemic, methods of collecting data were an online survey where only students who had access to the internet could participate in this study. which could limit students who hadn't access to the internet to participate in this study. Due to during the COVID-19 pandemic, most students were aware of hygiene practices such as washing hands during the pandemic, therefore, this could result in higher scores on hygienic-related questions and due to the study collected data with the online form, some students might use the Internet to search for answers during the survey. because they wanted to give themselves a high score.

Conclusions

Participants had a low level of knowledge of drug resistance and a moderate level of drug resistance preventive behaviors. Factors influenced drug resistance preventive behaviors of students in grades 10-12 Deebuk Phangnga Wittayayon school were knowledge about drug resistance and gender of students. Both of which had a positive correlation with drug resistance preventive behaviors. Knowledge about drug resistance was an influential factor in predicting drug resistance preventive behaviors. Therefore, knowledge on the prevention of drug resistance should be promoted to enhance drug resistance preventive behaviors. By providing knowledge and information about drug resistance and the correct use of antibiotics through training and advice by experts.

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