

Effect of Antibiotic Abuse on Adults' Health

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Abstract

Background: Antibiotic abuse has potential serious effects on adult health, including the development of antibiotic resistance, which represents one of the most important challenges in the world. **Aim:** This study aimed to assess the effect of antibiotic abuse on adults' health. **Research design:** A descriptive analytical design used to conduct this study. **Setting:** The study was conducted at the outpatient clinic in Specialized Hospital which affiliated to Ain Shams University in Cairo governorate. **Subjects:** A purposive sample consisted of 377 adult patient who were diagnosed clinically and treated by antibiotics. **Tools:** Two tools were used for data collection: **1st tool:** an interviewing questionnaire for adults included three parts: I. Demographic data, II. Adults' knowledge and III. Reported practices about antibiotic abuse and **2nd tool:** Adults' health status assessment sheet consist of two parts: I. Physical examination, II. Medical history. **Results:** The results illustrate that the age of 37.9% of the studied sample ranged between >25 – 35 years, with Mean SD 33.4 ± 5.78 , 33.4% of them had history of chronic diseases, 33.3% had cardiac diseases, and 36.6% of them used an antibiotic without a doctor's prescription. Also, the study proved that 54.4% of the studied sample had unsatisfactory level of total knowledge, and 61.5% of them had unhealthy practices about antibiotic abuse. **Conclusion:** The study results concluded that there was a highly significant positive correlation between total knowledge and total reported practices related to antibiotic abuse. Therefore, there was a highly statistically significant relation between total knowledge and total reported practices of the studied sample and their history of using antibiotics without a doctor's prescription with (p -value = <0.001). **Recommendation:** Design seminars and workshops in relevant health sectors about antibiotic misuse and the importance of antibiotic resistance addressed to adults with chronic diseases and those treated with antibiotics.

Key words: Antibiotic Abuse – Adults' Health

Introduction

The discovery of antibiotics is one of the most crucial achievements of the 20th century, as it has rescued millions of people from infectious diseases. Over the years, the excessive

use and misuse of antibiotics have led to the development of acquired antimicrobial resistance (AMR) in

microbes, resulting from significant selection pressure (Hoffman, 2020).

Abusing antibiotics, particularly in low- and middle-income countries, significantly contributes to antimicrobial resistance and can pose a life-threatening risk in cases of severe hospital-acquired infections (HAI). The burden of antibiotic abuse and multidrug resistance (MDR) has

notably escalated in the past few decades. (Sartelli, et al., 2020)

The ESCAPE group of bacteria (Enterococcus faecium, Staphylococcus aureus, Klebsiella pneumoniae, Acinetobacter baumannii, Pseudomonas aeruginosa, and Enterobacter spp) are responsible for the most common hospital-acquired and multi-drug resistant infections. (Idris, & Nadzir, 2023).

Developing nations face a higher risk because of inappropriate use of antibiotics, usage of antibiotics in animals, lack of awareness about antimicrobial resistance (AMR), malnutrition, inadequate monitoring, and substandard healthcare. Furthermore, the insufficient development of new drugs means that existing options must be carefully used to maximize their therapeutic effectiveness (Abia, & Essack, 2023).

The abuse of antibiotics varies widely between countries, driven by social and cultural attitudes towards buying antibiotics from pharmacies without a legitimate prescription, self-treatment, not completing the full course of antibiotics, and sharing leftover antibiotics, which are all common unethical practices. (Blaser, et al., 2021)

In addition to hospitals and care facilities, it was documented in the general population. The primary sources of antibiotic resistance were identified as overuse, inappropriate prescribing, incorrect dosage schedules, and prolonged treatment duration; the developing tactic

known as "antibiotic-de-escalation" may hold the key to resolving these problems. (Biccard, et al., 2021)

Resistance to antibiotics is one of the most pressing worldwide challenges facing modern medicine and society at large, but it is also one of the least appreciated by both practitioners and the lay community. Many strains of multi-drug resistant bacteria, such as methicillin and vancomycin-resistant Staphylococcus aureus and multi-drug resistant Mycobacterium tuberculosis, continues to bedevil both developed and underdeveloped worlds. It is concerning that collectively, resistance to all textbook classes of antibiotics has emerged, which is contributing to 700,000 annual deaths due to drug-resistant diseases. (Nadgir, & Biswas, 2023)

Antibiotics resistance is the ability of microorganisms, such as bacteria, viruses, fungi, and parasites, to survive and proliferate in the presence of medications meant to destroy them. Antimicrobial-resistant organism infections are not only hard to cure, but they also carry a constant risk of serious illness and possibly even death. Antibiotics, antifungals, antivirals, disinfectants, and food preservatives are a few examples of antimicrobial agents that either kill or inhibit the growth and multiplication of microorganisms. (Rose, 2023).

Antibiotics can occasionally change the microbiota of the host, which can result in inflammation and chronic infection. Antibiotic side effects typically

include fever, nausea, and severe allergic reactions, such as anaphylaxis and photodermatitis. Diarrhea is a common antibiotic side effect that results from an imbalance of intestinal flora species or an overgrowth of pathogenic bacteria. **(Vallianou, et al., 2021)**

Other adverse effects included drug interactions, such as an increased risk of tendon damage when a corticosteroid and quinolone antibiotic are taken together. Antibiotic resistance in bacteria is caused by the overuse of fluoroquinolone and other antibiotics, which may make it more difficult to treat infections that are resistant to these drugs **(Malki, & Pearson, 2020)**.

One of the biggest issues affecting the environment and health is the alarming rise in antibiotic resistance among infectious bacteria, which has a negative impact on the economies of every nation on the planet. The majority of antibiotic classes, as well as antibiotic-resistant bacteria (ARB) and genes (ARGs), have been identified and documented in various environmental settings, such as groundwater, rivers, sediments, and drinking water. **(Yao, et al., 2022)**.

According to a significant research released in January 2022, 1.27 million fatalities were expected to be related to antimicrobial-resistant illnesses in 2019 alone, while drug-resistant infections were somehow responsible for approximately 5 million deaths. By 2050, this figure is predicted to rise to 10,000,000 annually, far exceeding cancer-related mortality. **(Taleb, et al., 2023)**.

At least 700,000 people currently pass away from drug-resistant illnesses every year, with multidrug-resistant tuberculosis accounting for over 230 thousand of these deaths. Over 30,000 women worldwide lose their lives to infections related to childbirth every year, and over 400 thousand newborns die from serious infections **(World Health Organization, 2022)**.

Community health nurses are essential in raising community awareness and preventing the emergence of antibiotic resistance. It is crucial to use antibiotics appropriately, which includes using the right medication at the right dose, when it is needed, and for the appropriate length of time depending on the disease condition after diagnosis. Clients should also be informed about the benefits and risks of each treatment option. **(Lalithabai and et al, 2022)**. The dosage needs to be carefully prescribed and adhered to by the manufacturer's instructions. Clinical trial data are used to determine the manufacturer's recommended doses, which are based on the idea that one dose fits all. **(Mittal, et al., 2020)**

Significant of the study:

Corrective action is necessary because over-the-counter drug use and dispensing of antibiotics are highly common in Egypt and have serious national and international repercussions. **(Srouf, K. 2020)**. The prevalence of over-the-counter use and dispensing of antibiotics is quite high in Egypt, with serious consequences nationally and

globally, which call for taking corrective actions. Awareness campaigns for public and health personnel and the enforcement of strict regulations are straightforward and effective interventions (Amin., et al.,2022).

According to **Mustafa, at al,(2021)** whom studied health literacy associated with antibiotic abuse among 508 non-medical university students in Egypt and decelerated that there was 39.9% of students reported having used antibiotics in the past month without a prescription. 92.2% had limited awareness of antibiotic resistance.

Another study reported fluoroquinolone resistance among methicillin-resistant *S. aureus* (MRSA) isolates from Alexandria, Egypt to range between 78% and 96% [16]. Among Gram negative pathogens, 94% of *E. coli* isolates were resistant to ampicillin and upward of 70% of *Acinetobacter baumannii* isolates from Alexandria Main University Hospital were MDR (**Abouelfetouh, Torky, Aboulmagd ., 2020**).

Aim of the Study

This study aimed to assess the effect of antibiotic abuse on adults' health through:

1. Assessing adults' knowledge related to antibiotic abuse.
2. Assessing adults' reported practices related to antibiotic abuse.
3. Assessing health status of adults' related to effect of antibiotic abuse.

Research questions:

1. What is the adults' knowledge related to antibiotic abuse?

2. What are adults' reported practices related to Antibiotic Abuse?
3. Is there a correlation between knowledge and reported practices of adults' related to antibiotic abuse?

Materials and Method

I. Technical Design:

It included research design, study settings, subject and tools of data collection.

Research Design:

Descriptive analytical research design was used.

Study Settings:

The study was conducted at the outpatient clinic in Specialized Hospital which affiliated to Ain Shams University in Cairo governorate which characterized by the most popular hospital and cover large sectors of Cairo city and had a high flow of adults with different health problems.

Subjects:

Sampling A purposive sample was used to collect the required sample from outpatient clinics with the following criteria:

Inclusion criteria:

- Patients who diagnosed clinically and treated by antibiotics.
- Patients (male or female) more than 18 years and to 45 years with all degrees of disease severity.

Sample size:

Sample size was calculated by sample size equations which the total population equal 20250 patients and study sample was estimated to be 377 patients" where the

confidence level 95%. So, the sample size was calculated by adjusting the power of the test to 80% and the confidence interval to 95% with margin of error accepted adjusted to 5% and using the following equation (*Mishra, Alok, 2022*).

$$n = \frac{N \times p(1-p)}{\left[\left[N-1 \times \left(d^2 \div z^2 \right) \right] + p(1-p) \right]}$$

Type I error (a) = 0.05

Type II error (B) = 0.2

With power of test 0.80

n=sample size

z: The standard score (1.64)

d: The error rate (0.05)

p: Property availability and neutral ratio (0.50)

N=size of population

Tools of data collection:

The data were collected using the following two tools:

It was developed by the investigator based on reviewing related literature, magazines, and three experts' opinions written in Arabic to assess the effect of antibiotic abuse on adult health.

First tool: A structured interviewing questionnaire included the following three parts.

Part (I): to assess the demographic characteristics of the studied sample of adults treated with antibiotics. This part included 7 closed-ended questions, such as age, gender, education level, marital status, place of residence, occupation, and family income (Q1: Q7).

Part (II): to assess adult's knowledge related to antibiotic abuse. This part included 17 closed and open-ended questions such as (concept of antibiotics, indications for using antibiotics, methods of giving antibiotics, antibiotics abuse leads to antibiotic resistance, concept of antibiotic resistance, antibiotic abuse which leads to never using of these antibiotics later, antibiotic abuse leads to complications later, side effects that occur in the body system, allergic reactions, signs of an allergy, complications that occur from the misuse of antibiotics, antibiotic abuse affects the beneficial bacteria in the intestine, dealing with leftover liquid antibiotics, antibiotic intake times, the dose of antibiotics, the time when the antibiotic dose should be stopped, and the source of information (Q8: Q24).

Scoring system of knowledge:

The statements have two possible responses: "True", or "False." Each response is assigned a score ranging from a (0) mark for "False" to a (1) mark for "True", the scoring ranged from zero to one; the correct answer was scored (1), and the incorrect answer was scored (zero). These scores were summed up and categorized into 2 levels, as follows:

Unsatisfactory knowledge < 50%

Satisfactory knowledge > 50%

Part (III): to assess reported practices of adult's toward antibiotics abuse. This part was developed by an investigator which consisted of 12 closed ended questions with Likert scale for three levels always, sometimes, and never. (Q25:Q36).

Scoring system of reported practices.

Each report practices item contained three possible responses scored as follows: always, sometimes, and never. The score for each item ranged from 0:2 score. Each point according to positive

statement was estimated as two score for “always”, one score for “sometimes”, then zero score for “never” and vice versa in the case of a negative statement.

Total score was calculated through summed up all items score where it consisted of 12 points times 2 core equal 24 marks which converted to a ratio and categorized into two levels as follow.

- Unhealthy Practices < 50%
- Healthy Practices > 50%

Second tool: Adult health status assessment sheet: This tool was used to assess health status of adult which consisted of 15 open and closed ended questions:

- **Part (I):** Physical examination: This part consisted of 3 questions.
- **Part (II):** Medical history and current health complaints: This part consisted of 12 questions.

This part assess Adult health status such as weight, height, body mass index, current problem, effect of antibiotics abuse, history of drug allergy, chronic diseases history, surgical history, and food allergy.

The scoring system according to the scale of BMI was divided into categories (Dude, Theodor, 2015).

- Under weight (18.5)
- Normal weight (18.5 to <25)
- Overweight (25.0 to <30)
- Obese (30.0 or higher)

Validity and Reliability:

Content and face validity were performed by 3 professors of the community health nursing department, all experts were affiliated to Ain Shams University, Egypt who reviewed the tools for content accuracy.

The developed tools were tested for reliability on a sample of 37 subjects who represent 10% of the total sample. The reliability test of the tool was established by using the Cronbach alpha and Pearson correlation which showed good internal consistency construct validity Cronbach alpha = (0.887).

The pretest was carried out to test the reliability as the following:

Reliability of data collection tools.

Cronbach's Alpha	Data collection tools
Socio demographic data	0.780
knowledge related to antibiotic abuse	0.810
Practices related to antibiotic abuse	0.820
Health problems	0.880

II. Operational Designed:

It included operational design for this study consisted of four phases, namely preparatory phase, ethical considerations, pilot study, and fieldwork.

Preparatory Phase:

This phase included reviewing of literature related to knowledge and practices of adults related to antibiotics abuse. This served to develop the study tools for data collection. During this phase. The investigator also visited the selected places to get acquainted with the personnel and the study settings. Development of the tools was under supervisors' guidance and experts' opinions were considered.

Ethical Considerations:

The research approval was obtained from the faculty of nursing Ethical Committee before starting the study.

All ethical considerations were considered for ensuring patients' privacy and confidentiality of the collected data during the study. Firstly, the study protocol is agreed by the Ethical Committee affiliated to Faculty of Nursing Ain Shams University. Secondly the purpose and nature of the study were explained for the participants and written consent was taken to gain participation after explaining the purpose of the study and being informed that each study subject is free to withdrawal at any time through the study. Finally, all selected study samples agreed to participate in the study and were assured that the study would pose no risks or hazards on their social, psychological, or physical health.

Pilot Study:

A pilot study was conducted at the beginning of the study for 37 cases (10% of the total sample) to investigate the feasibility of data collection tools, content, validity, clarity, and simplicity. It took about one month from the beginning of October 2023. Then some modifications were done and subjects of pilot study were excluded from the actual study sample.

Fieldwork:

The actual process of data collection was carried out in three months, consequently the period from the beginning of November until the end of January 2024, in order to collect the total sample of 377 patients. The investigator introduced herself to the directors of the previously mentioned setting supervisors, the supervisors of outpatient clinics and nurses, who helped in sample collection to save time and to also gain the trust of patients.

The investigator explained the aim of the study to each patient and then interviewed the questionnaire sheet after clearly explaining the way to fill it out. The interviewing tools took about a maximum of 30 minutes for every patient and the medical history record took about 15 minutes for each one.

Collecting data took 45 minutes to collect the data for each patient, and met about 9: 10 patients per day, for three days a week (Sundays, Tuesdays, and Thursdays) over a period of three months.

III. Administrative Design:

An official letter from the Dean Faculty of Nursing was delivered to the director of the intended study setting. A full explanation about the aim of the study was explored and formal patient's consent was obtained to carry out this study.

IV. Statistical Analysis:

Data was analyzed and tabulated using the Statistical Package for Social Science (SPSS) version 22. Qualitative data was presented as number and percentage. Relations between different qualitative variables were tested using Chi-square, Pearson Test, and correlation coefficient (r). Probability (p-value) not significant ≥ 0.05 , significant < 0.05 , and High significant < 0.001 .

Results

Table (1) displays that, 37.9% of the studied sample their age ranged between $>25 - 35$ years, with Mean SD of 33.4 ± 5.78 years. Regarding gender and marital status, 52.3% and 63.1% of them were female and married, respectively. Also, 43.8% of them have higher education. Moreover, 83.3% of them residing in urban areas. Furthermore, 48.0% of them were employees.

Additionally, 56.0% of them reported that the family income was not enough.

Figure (1) shows that 54.4% of the studied sample have an unsatisfactory level of total knowledge about antibiotic abuse. While 45.6% of them have a satisfactory level of total knowledge.

Table (2) demonstrates that 52.0% of the studied sample always wash hands with soap and water and dry them before taking the antibiotic. While 54.9% and 54.7% of them sometimes do not double the next dose in order to make up for the deficiency and sometimes change the doctor when he insists not to prescribe or prescribe an antibiotic to treat my disease, respectively. Also, 63.4% of them sometimes take antibiotics according to the doctor's prescription only.

Figure (2) shows that 61.5% of the studied sample have unhealthy practices related to antibiotic abuse. While 38.5% of them have healthy practices.

Table (3) illustrates that 36.6% of the studied sample use an antibiotic without a doctor's prescription, 59.4% of

them use Augmentin. Also, 62.3% of them take an antibiotic sore throat with fever and use an antibiotic without a doctor's prescription because they do not prefer to see a doctor. Furthermore, 54.3% of them depend on choosing an antibiotic based on a previous prescription from a doctor. In addition, 36.9% of the studied sample took antibiotics in the past year (1 - 2) times.

Figure (3) regarding the effect of using antibiotics from yourself on your health shows that, 15.2% of the studied sample had relieve signs and symptoms of infection. While 44.9% of them had antibiotics resistance due to antibiotic abuse. Also 31.9% of them had Low immunity (recurrent infection). Moreover, 8.0% of them had gastrointestinal disturbances related to antibiotic abuse.

Table (4) indicate that, there was highly significant positive correlation between total knowledge and total reported practices related to antibiotic abuse among the studied sample ($r = 0.422$ and $p\text{-value} = <0.001$).

Table (1): Frequency distribution of the studied sample according to their demographic characteristics (n=377).

Demographic characteristics of the studied sample		No.	%
Age (years)			
19 - 25		104	27.6
>25 - 35		143	37.9
>35 - 45		130	34.5
Mean SD	33.4 ± 5.78		
Gender			
Male		180	47.7
Female		197	52.3
Education level			
Illiterate		4	1.1
Basic education		36	9.5
Secondary education		134	35.5
High education		165	43.8
Postgraduate studies		38	10.1
Marital status			
Single		98	26.0
Married		238	63.1
Divorced		25	6.6
Widowed		16	4.2
Place of residence			
Rural		63	16.7
Urban		314	83.3
Occupation			
Employee		181	48.0
Don't work		38	10.1
Student		51	13.5
Handicraft		27	7.2
Working in the health field		80	21.2
Family income			
Enough		166	44.0
Not enough		211	56.0

Figure (1): Percentage distribution of the studied sample according to their total knowledge about antibiotic abuse (n=377).

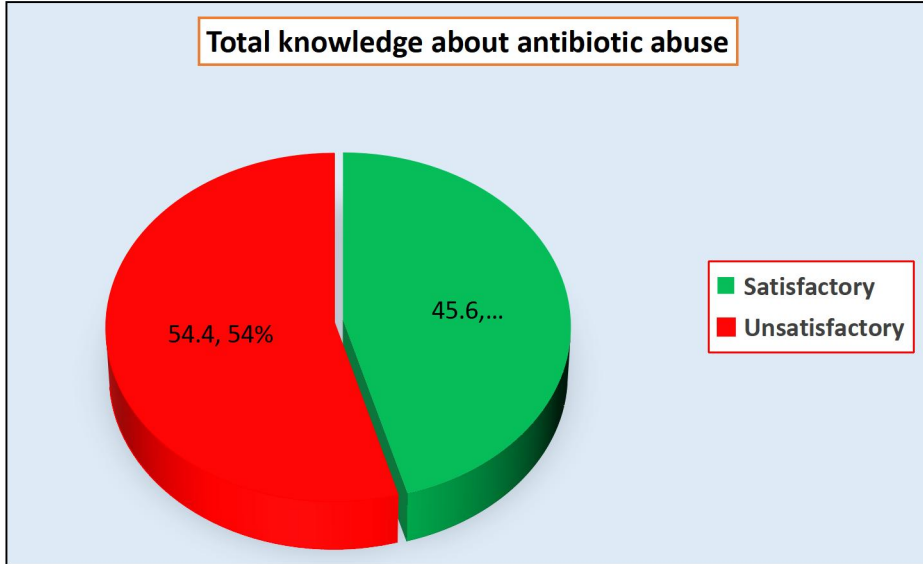


Table (2): Frequency distribution of the studied sample according to their reported practices related to antibiotic abuse (**n=377**).

Items	Always		Sometimes		Never	
	No	%	No	%	No	%
Wash hands with soap and water and dry them before taking the antibiotic.	196	52.0	153	40.6	28	7.4
Take antibiotics according to the doctor's prescription only.	68	18.0	239	63.4	70	18.6
Stop the antibiotic after taking the full dose recommended by the specialist doctor.	130	34.5	188	49.9	59	15.6
Do not reduce the dose of antibiotics when the condition improves.	84	22.3	167	44.3	126	33.4
Do not stop the antibiotic when improving.	86	22.8	199	52.8	92	24.4
Stop the antibiotic when an allergic reaction occurs.	78	20.7	205	54.4	94	24.9
Skip the missed dose if the time for the next dose is close	87	23.1	197	52.2	93	24.7
Do not double the next dose in order to make up for the deficiency	79	21.0	207	54.9	91	24.1
Inform the doctor about the other medications that are being taken to prevent drug interaction.	82	21.8	189	50.1	106	28.1
I change the doctor when he insists not to prescribe or prescribe an antibiotic to treat my disease.	80	21.2	206	54.7	91	24.1
Do not store antibiotics at home for emergencies.	74	19.6	187	49.6	116	30.8
Do not take antibiotics without referring to the attending physician if I have the same symptoms of a previous disease.	122	32.4	160	42.4	95	25.2

Figure (2): Percentage distribution of the studied sample according to their total reported practices related to antibiotic abuse (n=377).

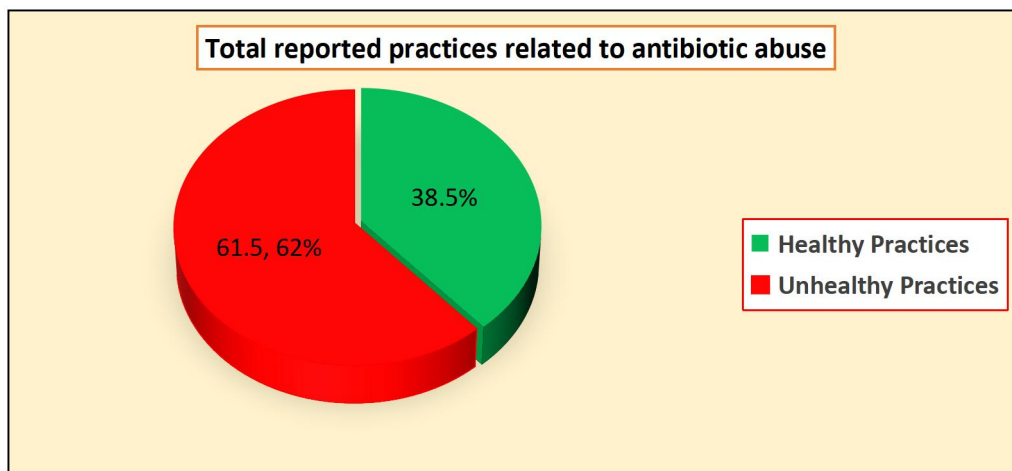


Table (3): Frequency distribution of the studied sample according to past history related antibiotics abuse (n=377).

Past history	No.	%
Using of an antibiotic without a doctor's prescription		
Yes	138	36.6
No	239	63.4
If yes, what is the name of the antibiotic? (n=138)		
Augmentin	82	59.4
Flummox	46	33.3
Unasyn	10	7.3
*Type of complaint did you use antibiotics for yourself (n=138)		
Runny nose with coughing	29	21.0
Nasal congestion	64	46.4
Sore throat with fever	86	62.3
Body pain with fever	22	15.9
Nausea- Vomiting- Diarrhea	25	18.1
Skin wounds and allergy	14	10.1
*Reasons for treating yourself with antibiotics (n=138)		
Saving money	76	55.1
Saving time and effort	15	10.9
I do not prefer to see a doctor	86	62.3
Choice of antibiotic depends on (n=138)		
A directive from a pharmacist	20	14.5
The opinion of family and friends	25	18.1
Your previous options	18	13.1
A previous prescription from the doctor	75	54.3
Times of taking antibiotics in the past year		
(1 - 2) times	139	36.9
(3 - 5) times	128	33.9
More than 5 times	110	29.2

(*) Responses not mutually exclusive.

Figure (3): Percentage distribution of the studied sample according to their total knowledge about antibiotic abuse (n=138).

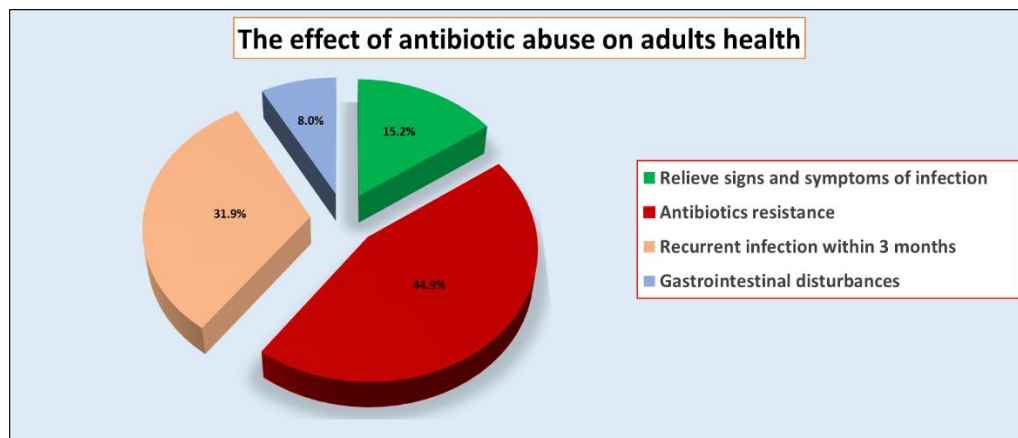


Table (4): Correlation between total knowledge and total reported practices related to antibiotic abuse among the studied sample (n=377).

Items	Total reported practices	
	r	P-value
Total knowledge	0.422	0.000**

r= correlation coefficient test. **Highly significant correlation at $p < 0.01$.

Discussion

Antimicrobial resistance is a global public health challenge, which has accelerated by the overuse of antibiotics worldwide. Increased antimicrobial resistance is the cause of severe infections, complications, longer hospital stays and increased mortality. Overprescribing of antibiotics is associated with an increased risk of adverse effects, more frequent re-attendance, and increased medicalization of self-limiting conditions. Antibiotic overprescribing is a particular problem in primary care, where viruses cause most infections (Riley & Olans, 2021).

A lack of knowledge on antibiotic use in the general public has been reported, with more than half of them who thought that antibiotics are useful in treating viral infections, and about one half of them would stop taking antibiotics when they felt better.

Those who were aware of antibiotic resistance were unaware that misuse of antibiotics could lead to this global crisis. Those who had poor knowledge of antibiotic use were associated with a higher probability of antibiotic self-medication and practices of using leftover antibiotics, sharing antibiotics, keeping antibiotics for future use and stopping antibiotics when symptoms disappear. Inappropriate practices related to antibiotics, including self-medication, were reported to be common among older adults (Kong et al., 2019).

This study aims to assess the awareness of adult health about misuse of antibiotics.

Part (I): Demographic characteristics of the studied sample

Regarding age of the studied sample, the results of the present study revealed that more than one third of the studied sample their age ranged between $>25 - 35$ years, the Mean SD of age was 33.4 ± 5.78 years (**Table 1**). This result was in the same direction with **Hu et al., (2020)** who conducted a study entitled "Antimicrobial resistance is a global problem—a UK perspective" in Chinese and showed that nearly half of the studied subjects their age was ranged from 25-35 year.

Also, this result is consistent with **Manderson, (2020)** who carried a study in South Africa, about " Prescribing, care and resistance: antibiotic use in urban South Africa " and reported that 33% of the participants aged between 25 and 35 years.

From the researcher's point of view, this result may be due to this age group patients not being concerned about returning to doctors for health problems and depending on obtaining the traditional antibiotic they used.

Regarding gender and marital status, the results of the present study revealed that, more than half and less than two third of the studied sample were female and married, respectively (**Table 1**).

These results were consistent with **Byrne et al., (2019)** who applied a study under the title of "The drivers of antibiotic use and misuse: the development and investigation of a theory driven community measure" in Australia and presented that most of the participants were female and married. Also, that similar to **Chang et al., (2019)** who carried out a study entitled "Clinical pattern of antibiotic overuse and misuse in primary healthcare hospitals in the southwest of China" and reported that there was 52% of the respondents were female, and the majority of them were married.

According to the investigator, women who frequented drug stores were more likely than men to buy antibiotics without a prescription. This could explain the results. Additionally, more than half of the study sample was of productive age and marriage.

Regarding the educational level of the studied sample, the current study showed that less than half of the studied sample had high education (**Table 1**). This finding agrees with **Mallah et al., (2022)** at a study conducted in Autonomous University of Barcelona and entitled " Education level and misuse of antibiotics in the general population: a systematic review and dose–response meta-analysis" which found that 67% of the studied sample had high educational level.

But this result was in difference with the study performed by **Fuller et al., (2023)** who conducted their study entitled "Education and Awareness on Antimicrobial Resistance in the WHO African Region: A Systematic Review" and indicated that 54% of the respondents had medium education.

The present study showed that, most of the studied sample were residing at urban areas. Furthermore, nearly half of them were employees. Additionally, more than half of them reported that the family income was not enough (**Table 1**).

These results were similar to the result of study in Bab El Shaeria Hospital performed by **Allel et al., (2020)** who conducted their study entitled "Socioeconomic factors associated with antimicrobial resistance of *Pseudomonas aeruginosa*, *Staphylococcus aureus*, and *Escherichia coli* in Chilean hospitals" and found that 55% of the studied sample was worker and had low economic status.

Also, this result comes in the same line with **Janssen et al., (2022)** who

conducted their study about "Exploring the economic impact of inappropriate antibiotic use: the case of upper respiratory tract infections in Ghana" and proved that were living at urban areas and were employee.

From the researcher's point of view, this finding may confirm that socioeconomic factors as economic condition may affect the emergence and dissemination of antimicrobial resistance.

Answer of the research question (1) "What is the adult's knowledge related to Antibiotic Abuse?"

Concerning the studied sample's total knowledge about antibiotic abuse, the present study illustrated that more than half of the studied sample had an unsatisfactory level of total knowledge about antibiotic abuse. While less than half of them had a satisfactory level of total knowledge (**Figure 1**).

This result was in the same line with **Bogale et al., (2019)** who carried out a study under the title "Knowledge, attitude, and practice of self-medication with antibiotics among community residents in Addis Ababa, Ethiopia" showed that most of the respondent had poor level of total knowledge about antibiotic abuse.

Also, this result was in harmony with **Al-Yasseri et al. (2019)** at a study conducted in Baghdad entitled "Public knowledge and attitudes towards antibiotics use and resistance in Baghdad, Iraq: a survey conducted in outpatient department of university teaching hospital" and stated that most of the participants did not have sufficient knowledge about antibiotics use and consequences of their over/misuse.

From the view point of the researcher's, this result may be due to lack of health insurance policies and strategies

to provide awareness programs about antibiotic use and resistance at different health care setting with different educational methods to the population of the community to improve public awareness about such subjects.

Part (IV): Assessment of adult's reported practices related to antibiotic abuse.

Concerning adult's reported practices related to antibiotic abuse, the current results represented that more than half of the studied sample always wash hands with soap and water and dry them before taking the antibiotic. While, more than half of them sometimes did not double the next dose in order to make up for the deficiency and sometimes change the doctor when he insists not to prescribe or prescribe an antibiotic to treat my disease, respectively. Also, less than two thirds of them sometimes take antibiotics according to the doctor's prescription only (**Table 2**).

These findings agree with **Paredes et al., (2019)** who studied " Parental antibiotic use in urban and peri-urban health care centers in Lima: a cross-sectional study of knowledge, attitudes, and practices" in USA and mentioned that 62.3% of the studied sample reported that topped using antibiotic based on the physician's instruction and did not double the next dose without doctor order.

Additionally, in the same direction with **Kharaba et al., (2024)** at a study conducted in United Arab Emirates and entitled "Health literacy, knowledge, household disposal, and misuse practices of antibiotics among UAE residents: a nationwide cross-sectional study" showed that the majority of participants reported using a medical prescription to dispense antibiotics without recurrence by self.

Answer of the research question (2) “What are the adult’s practices related to Antibiotic Abuse?”

Regarding total reported practices related to antibiotic abuse among the studied sample, the present study revealed less than two thirds of the studied sample had unhealthy practices related to antibiotic abuse. While more than one third of them had healthy practices (**Figure 2**).

This finding agrees with **Bhat et al., (2023)** at a study entitled "A cross-sectional study on public knowledge and awareness of antibiotic use and antimicrobial resistance in Mangalore, India" which revealed that 53% of the participants had poor practice regarding antibiotic use and resistance.

This result was inconsistent with **Geta & Kibret, (2022)** at a study entitled "Knowledge, attitudes and practices of patients on antibiotic resistance and use in Public Hospitals of Amhara Regional State, Northwestern Ethiopia: a cross-sectional study" which revealed that 54.7% of the participants had positive practice regarding antibiotic use and resistance.

From the investigator’s point of view, this finding might be due to major defects in the individual knowledge about appropriate antibiotics use, as well as lack of awareness on “antimicrobial resistance” problem. Awareness about appropriate antibiotic use and the serious consequences of antibiotic misuse leading to unhealthy practice toward antibiotic use.

Regarding effect of antibiotics abuse among the studied sample, the current study showed that more than one third of the studied sample used an antibiotic without a doctor's prescription, more than half of them used Augmentin. Also, two thirds of them took antibiotics for sore throat with fever, and used an antibiotic without a doctor's prescription because they did not prefer to see

a doctor. Furthermore, more than half of them depend on choosing an antibiotic based on a previous prescription from a doctor. In addition, more than one third of the studied sample took antibiotics in the past year (1 - 2) times (**Table 3**).

This comes in accordance with **Schwartz et al., (2022)** who carried out a study in Canada about " Unnecessary antibiotic prescribing in a Canadian primary care setting: a descriptive analysis using routinely collected electronic medical record data “which revealed that most of participants took non-prescribed antibiotics at some illness condition.

This finding disagreed with **Bianco et al., (2020)** who carried out a study Italian about "Knowledge and practices regarding antibiotics use: findings from a cross-sectional survey among Italian adults” which demonstrated that the majority of participants didn’t take non-prescribed antibiotics according to their policy.

From the researcher’s point of view, this result may relate to the cultures and traditions of the society which some of them allowed for non-prescribed antibiotics without limitation while, the other society prevent that at all health care settings.

Figure (3) regarding the effect of using antibiotics from yourself on your health shows that, less than fifth of the studied sample had relieve signs and symptoms of infection. While about half of them had antibiotics resistance due to antibiotic abuse. Also less than one quarter of them had low immunity (recurrent infection). Moreover, few of them had gastrointestinal disturbances related to antibiotic abuse.

This finding agrees with **Bhat et al., (2023)** at a study entitled "A cross-sectional study on public knowledge and awareness of antibiotic use and antimicrobial resistance in Mangalore, India" which revealed that 66% of the participants had poor effect on health regarding antibiotic abuse and resistance.

This comes in accordance with **Augusto Sola, (2022)** who carried out a study in Argentina about " Abuse of Antibiotics in Perinatology: Negative Impact for Health and the Economy ;which revealed that antibiotic abuse can lead to antibiotic resistance, microbiome alterations, and dysbiosis, which have been associated with serious complications such as infections, abnormal brain development, allergies, autoimmune disorders, obesity, and an increase in mortality as well as an increase in health care expenditures.

From a researcher's perspective, these result may due to easy availability of antibiotics without a prescription, leading to inappropriate self-medication. And patient non-compliance, patients sometimes fail to complete the full course of antibiotic treatment as prescribed, allowing bacteria to develop resistance.

Answer of the research question (3) "Is there a correlation between knowledge and practices of adult related to antibiotic abuse?"

Concerning correlation between total knowledge and total reported practices related to antibiotic abuse among the studied sample, the current study showed that there was highly significant positive correlation between total knowledge and total reported practices related to antibiotic abuse among the studied sample (**Table 4**).

As well as **Pogurschi et al., (2022)** who conducted a study in Roman entitled "Knowledge, attitudes and practices regarding antibiotic use and antibiotic

resistance: a latent class analysis of a Romanian population" cleared that there was a positive correlation between total score of knowledge and practice related to antibiotic resistance among the studied sample with significant relation.

On the same line, **Kainga et al., (2023)** at a study entitled "Determinants of knowledge, attitude, and practices of veterinary drug dispensers toward antimicrobial use and resistance in main cities of Malawi: a concern on antibiotic stewardship" in South Africa stated that there was a positive correlation between total score of knowledge and practice among the sample regarding antibiotic resistance and overuse. Also, **Geta & Kibret, (2022)** illustrated that there was a significant positive correlation between knowledge and practices related to antibiotic abuse and resistance among the studied subjects.

From the researcher's point of view, this result may be attributed to the level of practice, which is influenced by the level of awareness and knowledge.

Conclusions

The result of this study concluded that more than half of the studied sample had an unsatisfactory level of total knowledge, and less than two thirds of them had unhealthy practices about antibiotic abuse. While there was a highly significant positive correlation between total knowledge and total reported practices related to antibiotic abuse, Therefore, there is a highly statistically significant relation between total knowledge and total reported practices of the studied sample and their history of using of an antibiotic without a doctor's prescription with (p-value = <0.001)..

Recommendations

-Based on the main study findings, the following recommendations were deducted:

- 1 Develop guiding programs for patients who are treated with antibiotics about appropriate usage of antibiotics.
- 2 Design seminars and workshops about antibiotic misuse and the importance of antibiotic resistance addressed to adults with chronic diseases and those treated with antibiotics.
- 3 Activating the role of the community health nurse as a health educator in the different community health services settings toward raising population awareness about antibiotics resistance.
- 4 Further research to study the effect of counseling program about antibiotics abuse on adults' awareness.
- 5 Further research to study the effect of antibiotics abuse on other age groups' health.

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