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Self-Medication with Antibiotics Based on the Theory of Planned Behavior among an Egyptian Rural Population during the Era of COVID-19 Pandemic

Ayah M. Barakat, Marwa M. Mohasseb

Family Medicine Department, Faculty of Medicine, Menoufia University, Menoufia, Egypt

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A B S T R A C T

Background: Self-medication with antibiotics (SMA) is a major behavioural problem that can lead to antimicrobial resistance. With the emergence of COVID-19, it is gradually becoming the focus of attention. Constructs from the theory of planned behaviour (TPB) can be used to depict an individual's actions. **Objective**: to investigate the SMA behaviour, and its associated factors based on the TPB in an Egyptian rural population. **Methods:** A cross-sectional study was conducted among 245 adults living in a rural area in Egypt. Participants were assessed using a questionnaire that included personal and socioeconomic data, questions about SMA behaviour within the previous three months, TPB constructs, SMA knowledge, and COVID-19 specific knowledge. **Results**: SMA was practiced by about 38% of the participants, within 3.4 days of symptom appearance. The associated symptoms include fever (76.1%), respiratory symptoms (59.8%), and gastrointestinal symptoms (43.5%). Its predictors were positive perceived behavioural control (OR 3.5, P=0.002), positive subjective norms (OR 2.9, P=0.003), having an intention to practice SMA (OR 2.5, P= 0.003), and positive attitude (OR 1.7, P= 0.005). Other predictors included internet use for getting medical information (OR 2.1, P=0.02), lack of health education about COVID-19 (OR 2.1, P= 0.03), and younger age (OR 0.9, P= 0.03). **Conclusion:** SMA prevalence is considerably high. In the Egyptian rural community, attitudes, subjective norms, perceived behavioural control, and intent all predicted SMA, therefore the theory of planned behaviour will be an appropriate foundation for constructing an educational intervention to minimize SMA behaviour, particularly in high-risk young people.

INTRODUCTION

Self-medication with antibiotics (SMA) has been identified as inappropriate and irrational use of antibiotics which included taking the antibiotics without prescription, sharing or the use of leftovers by oneself or other people, and using old prescriptions or someone else's prescription to buy medications.[1] It was found to have a global prevalence of 32.5–81.5%.[2] It is a serious public health issue affecting both developed and developing countries.[3] SMA may lead to inappropriate medicine selection based on inaccurate diagnosis, incorrect dosage, delay in seeking appropriate healthcare when needed, adverse drug interaction, and antibiotic resistance.[4]

Antibiotics' position within the classification of medications (prescription vs. non-prescription/OTC) varies from one country to another. Antibiotics are subjected to a variety of restrictions.[5] Although it is illegal in Egypt to give antibiotics without a prescription, there are no active restrictions or policies in place to prevent this. As a result, antibiotic dispensing and consumption have grown.[6]

With the emergence of the COVID-19 pandemic, self-medication has become more common among various communities.[7] Inappropriate care-seeking behavior due to fear of infection from healthcare facilities, media that spread COVID-19-related

Corresponding Author: Ayah Mustafa Barakat, Department of Family Medicine, Faculty of Medicine, Menoufia University, Menoufia, Egypt. Email: ayahmustafa@ymail.com; aya.mustafa730@med.menofia.edu.eg

rumors and incorrect information about COVID-19-prevention and treatment medications, and other factors such as cultural beliefs, level of education, and medication availability may all contribute to increased self-medication practice during the COVID-19 pandemic.[8]

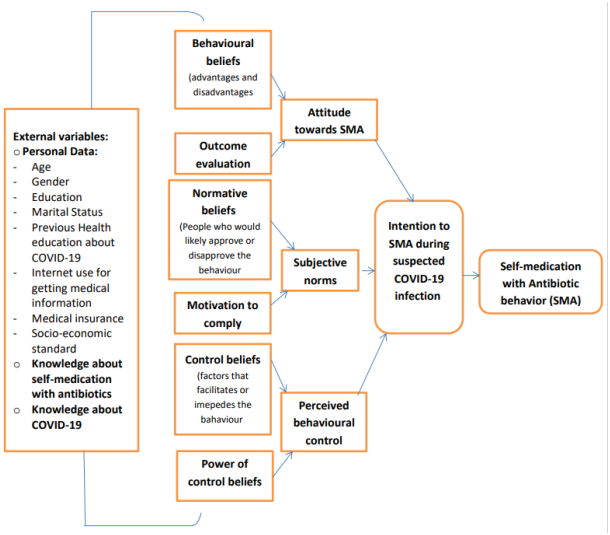

Figure (1): The theoretical and conceptual framework for this study

Individual behavior influences disease prevention and health maintenance. Beliefs, values, and habits influence individual behavior. Sociologists and psychologists have attempted to understand the elements influencing health behavior by developing several models and hypotheses.[9] Ajzen (1991) developed the theory of planned behavior (TPB), which is one of the most popular models that is used to explain an individual's behaviors of self-control and predict behavior change.[10]

The theory assumed that behavioral intention is the most important determinant of behavior, and it shapes the individual practice of certain behavior based on the three main constructs: attitude toward performing the behavior, subjective norms, and perceived control over the behavior.[5] Attitude is the extent to which a person views a behavior favorably or unfavorably. It is a subjective assessment of the benefits and drawbacks of an action. It depends on an individual's beliefs about the advantages and disadvantages of the behavior (behavioral beliefs) and the negative or positive evaluations of the behavior's outcomes (outcome evaluation).[9] Subjective norms reflect the individuals' perception of whether important others approve of the behaviors. It is determined by normative beliefs of the individual (beliefs about whether important people to the person would like or dislike doing the behavior) and the motivation to comply with those important people. Perceived behavior control describes how people perceive their capacity to conduct a specific behavior. It is evaluated by control beliefs (beliefs about barriers and facilitators to perform the behavior) and control beliefs power (the power to control the behavior).[11] According to the TPB theory, information about common perceptions of benefits, drawbacks, supporters or opponents, and enablers or hinderers of the provided behavior can be utilized to analyze predictors of that behavior using the TPB constructs.[5]

Previous studies globally have evaluated the associations between knowledge, attitude, subjective norm and practice control, and self-medication behavior.[10,12] However, the results of these studies vary due to the population differences, and it is still unknown which factor is more important than others. No studies were conducted in Egypt to explain antibiotic self-medication and its determinants based on the TPB during the COVID-19 era.

The objective of this study is to identify the SMA behavior during the era of the COVID-19 pandemic and to explore its predictors based on TPB constructs

METHOD

A cross-sectional community-based study was conducted in Munshaat Sultan village, Menoufia governorate, Egypt during the period from the 1st of June 2021 till the end of April 2022.

The participants were selected by multistage random sampling technique. Egypt consists of twenty-seven governorates, one of which is Menoufia governorate. Menouf district was randomly selected from the nine districts affiliated to Menoufia governorate and Munshaat Sultan village was selected from the eight villages affiliated to Menouf district randomly. The village has about 11400 total population of 18 years old or more. The total number of households is 5171, and the number of houses in the village is 3500, according to the data obtained from the local administrative authority of the village.

The target population was adults aged ≥18 years living in Munshaat Sultan village. The participants who had a background of medical education (physician, nurse, pharmacist) were excluded from the study.

The sample size was calculated to be 237 based on the prevalence of antibiotic self-medication which

was 19.5%, [12] considering the confidence interval of 95%, and the margin of error at 5%. The sample was increased to 250 participants to overcome incomplete questionnaires which were identified after data collection and were five. So, the actual sample size was 245.

The houses were selected through a systematic random sampling technique. Thus, one house was chosen for every 14 houses until the completion of the sample size, and it was obtained by dividing the number of houses in the village (3500 houses) by the number of the sample (250 adults). Munshaat Sultan family health unit was the starting point. If more than one family was found in a house, one of them was selected by a simple random sampling technique. Houses in which an adult resided and was not present during the visit were revisited once. During the second visit, if the adult person was absent, he /she was excluded from the study, and the next eligible study participant from the next household was included in the study to complete the sample size. The houses were visited with the help of social workers affiliated with the Munshaat Sultan family health unit.

Table (1): Pattern of antibiotic use among the participants who self-medicate with antibiotics (SMA)

Item	N (92)	(%)
Type:		
Amoxicillin	25	27.2
Erythromycin	50	54.3
Antimalarial drugs	48	52.2
Others*	26	28.3
Don't know	44	47.8
The duration between symptom appearance and antibiotic use (in days)	3.4±1.1**	
Reason for SMA:		
Having severe symptoms	49	53.3
Long-distance to a healthcare facility	67	72.8
Pharmacy is more easily accessible	30	32.6
Excessive cost of health service	62	67.4
Long waiting time at the health facility	51	55.4
Fear of COVID-19 infection	67	72.8
Sources of the antibiotics:		
Leftover antibiotics at home	53	57.6
Pharmacy	46	50
From a family member or a friend	42	45.7
Symptoms that caused SMA:		
Fever	70	76.1
Respiratory symptoms***	55	59.8
GIT symptoms****	40	43.5

Doxycycline, chloramphenicol, metronidazole, ciprofloxacin, levofloxacin **mean±SD, * Cough, Sneezing, Nasal congestion, Sore throat, Headache, Dyspnea, **** Diarrhea, vomiting, abdominal pain*

The questionnaire consisted of seventy-one Arabic questions and was divided into five main parts. The first part included 16 questions about age, gender, marital status, whether they had previously received health education related to COVID-19, whether they used the internet to get medical information, and whether they had medical insurance, in addition to ten questions to assess socioeconomic standard based on Fahmy et al.[13]

The second part included seven questions about antibiotic self-medication. They asked whether the participant self-medicated with antibiotics during the previous three months. They also inquired about the pattern of self-medicated antibiotic use in terms of the antibiotic name and duration between symptom appearance and using the non-prescribed antibiotics, type of symptoms, whether the participants suspected these symptoms as coronavirus infection, reasons for which the antibiotics without prescription were used, and the source from which the antibiotics were obtained.

The third part consisted of questions about the Theory of planned behavior constructs that were used to identify the participant's beliefs towards SMA and their intention to SMA during suspected COVID-19.[5] (Figure 1) It included seven sections: (I) behavioral beliefs (7 questions) and (II) outcome evaluation (7 questions) for presenting the attitude construct. Each item of 14 questions had a five-point Likert scale ranging from strongly disagree to strongly agree (scored as 1 to 5 for behavioral beliefs questions and -2 to +2 for outcome evaluation questions). A positive value of overall score (positive attitude) means that the participant is in favor of antibiotic self-medication and a negative overall score (negative attitude) means the participants are against the behavior; (III) normative beliefs (five questions) and (IV) motivation to comply (five questions) for presenting the subjective norms construct. Each item of ten questions had a five-point Likert scale ranging from strongly disagree to strongly agree (scored as 1 to 5 for motivation to comply questions and -2 to +2 for normative belief questions). A positive value of the overall score indicates that the

participant experienced social pressure to practice antibiotic self-medication and a negative overall score means participants experienced social pressure not to practice the behavior; (V) control beliefs (four questions) and (VI) the power of control beliefs (4 questions) presenting the construct of perceived behavioral control. Each item of eight questions had a five-point Likert scale ranging from strongly disagree to strongly agree (scored as 1 to 5 for control belief questions and -2 to +2 for control belief power questions). A positive value of overall score means that the participant feels in control of doing antibiotic self-medication and a negative overall score means participants do not feel in control of doing the behavior. (VII) participant's intention was measured by a single six-scaled question concerning the participant's willingness to use non-prescribed antibiotics if he/she has suspected COVID-19. The participants were classified into non-intenders when they answered no and intenders when they answered by 1 to 6. (Figure 1)

Table (2): General characteristics of the studied participants

	No SMA 153 (62.4%)	SMA 92 (37.6%)	Total 254 (%)	P-value	OR (95%CI)
General characteristics of the studied group					
Age (mean±SD)	44.2±14.1	40.1±11.9	42.7±13.4	0.02	-----
Gender:					
Male	54 (64.3)	30 (35.7)	84 (34.3)		-------
Female	99 (61.5)	62 (38.5)	161 (65.7)	0.7	
Marital status:					
Unmarried	33 (62.3)	20 (37.7)	53 (21.6)		
Married	120 (62.5)	72 (37.5)	192 (78.4)	0.9	------
Education:					
Illiterate or basic education	27 (51.9)	25 (48.1)	52 (21.2)		
Secondary education or equivalent	53 (70.7)	22 (29.3)	75 (30.6)	0.09	-------
University or postgraduate education	73 (61.9)	45 (38.1)	118 (48.2)		
Internet use for getting medical information:					
No	106 (72.6)	40 (27.4)	146 (59.6)	<0.001	1
Yes	47 (47.5)	52 (52.5)	99 (40.4)		2.9 (1.7- 5.1)
Had medical insurance:					
No	49(50.5)	48 (49.5)	97 (39.6)	0.001	1
Yes	104(70.3)	44(29.7)	148 (61.3)		0.4 (0.3-0.7)
Socioeconomic status					
Low or Medium	123 (63.4)	71 (36.6)	194 (79.2)	0.3	------
High	30 (58.8)	21 (41.2)	51 (20.8)		
Experience with COVID-19 and self-medication with antibiotics					
Received health education about COVID-19	88 (57.1)	66 (42.9)	154 (62.9)	0.02	1.9 (1.1-3.3)
Suspected infection with COVID-19	28 (35.4)	51 (64.6)	79 (32.2)	<0.001	5.6 (3.1-9.9)
Knowledge about COVID-19:					
Adequate	94 (62.7)	56 (37.3)	150 (61.2)	0.5	-----
Poor or Moderate	59(62.1)	36 (37.9)	95 (38.8)		
Knowledge about self-medication with antibiotics:					
Adequate	105 (66.9)	52 (33.1)	157 (64.1)	0.04	1.7 (1.3-2.9)
Poor or Moderate	48 (54.5)	40 (45.5)	88 (35.9)		1

**Student t-test*

The fourth part of the questionnaire included three questions that asked about the participants' knowledge of self-medication. The participant selected one of three options either true, false, or do not know. The correct answer received one point and the incorrect or do not know answer received zero points. A score of 50% or higher indicated adequate knowledge.[14]

The fifth part of the questionnaire comprised 12 questions that asked about the participants` knowledge of COVID-19. [15] The correct answer received two points and the incorrect or don't know answer received one point. A score of 60% or higher indicated adequate knowledge.[16]

***Validation*:** A pilot study was conducted on 20 adult participants who were excluded from the study sample to validate the Arabic questionnaire. Family medicine and public health professionals evaluated the questionnaire for its relevancy and ability to accurately measure antibiotic self-medication behavior and perceptions based on TPB. Previous surveys on the antibiotic self-medication behavior and the theory planned behavior model were reviewed. Other questions about COVID-19 were added. Cronbach's alpha calculated for the study questionnaire was 0.81, indicating good reliability.

All participants were interviewed at their houses through which they were informed about the study objectives, informed consent was obtained from them. All participants were asked to complete a predesigned self-administered questionnaire, while the illiterate participants were helped by the researchers.

Table (3): Beliefs toward self-medication with antibiotics based on TPB

Item	No SMA 153 (62.4%)	SMA 92 (37.6%)	Total (245)	P-value	OR (95%CI)
Attitude:					
Negative*	83 (54.2)	36 (39.1)	119 (48.6)	**0.02**	1.8 (1.1-3.1)
Positive	70 (45.8)	56 (60.9)	126 (51.4)		
Subjective norms:					
Negative*	88 (57.5)	30 (32.6)	118 (48.2)	**<0.001**	2.8 (1.6-4.8)
Positive	65 (42.5)	62 (67.4)	127 (51.8)		
Perceived behavioral control:					
Negative*	109 (71.2)	36 (39.1)	125 (59.2)	**<0.001**	3.9 (2.2-6.7)
Positive	44 (28.8)	56 (60.9)	11 (40.8)		
Intention to practice SMA:					
Not intender	116 (73.4)	42 (26.6)	158 (64.5)	**<0.001**	3.7 (2.1-6.5)
Intender	37 (42.5)	50 (57.5)	87 (35.5)		

**Reference (negative: refuse SMA, positive: accept SMA)*

Statistical Analysis: SPSS version 25 (SPSS Inc., Chicago, IL, USA) was used to analyze the data. Qualitative data were expressed as numbers and percentages, while quantitative normally distributed data were expressed as mean ± SD. Chi-square was used to assess the significance in bivariate analysis and odds ratios (OR) and their 95% CI were calculated. An Independent t-Test was used for comparing the means of two independent groups. A binary logistic regression analysis was performed to assess the predictors of self-medication with antibiotics., and a $P \leq 0.05$ was considered statistically significant.

RESULTS

This study was conducted on 245 participants. About 38% of them self-medicated with antibiotics during the three months before data collection.

When exploring the pattern of the used antibiotics, about (54%) of the participants reported using erythromycin, followed by antimalarial drugs (e.g., chloroquine) (52.2%) and doxycycline, chloramphenicol, metronidazole, ciprofloxacin, and levofloxacin were used by (28.3%) of the participants, and amoxicillin by (27.2%). About (48%) of them did not know the name of the antibiotic they used. (Table 1)

The antibiotics were used by the participants after an average of 3.4 days of symptom appearance. They reported using them without a doctor`s prescription due to fear of contracting COVID-19 (72.8%) during health facility visits, long distance to the nearest facility (72.8%), excessive cost of the health service (67.4%), long waiting time at the health facility (55.4%), experiencing severe symptoms (53.3%) and easy access to the nearest pharmacy (32.6%). Antibiotics were obtained from leftovers at home (57.6%), pharmacies (50%), and family members or friends (45.7%). (Table 1)

The most common symptoms for which SMA was practiced were fever (76.1%), respiratory symptoms (cough, sneezing, nasal congestion, sore throat, headache, dyspnea) (59.8%), and GIT symptoms (diarrhea, vomiting, abdominal pain) (43.5%). (Table 1)

In terms of age, there was a statistically significant difference between those who practiced SMA and those who did not. Participants who did not practice SMA were substantially older than participants who did (P=0.02). In addition, there was a statistically significant difference in internet use for getting

medical information between the two groups (P <0.001). (Table 2)

In terms of receiving COVID-19 health education, there was a statistically significant difference between the studied groups as the participants who practiced SMA were less likely to have received COVID-19 health education (P= 0.02). Participants with a suspected COVID infection were statistically more likely to engage in SMA (P <0.001). There was a statistically significant link between having enough knowledge of SMA's practice, as the non-SMA group had more adequate knowledge (P= 0.04). Furthermore, those with medical insurance were statistically more likely to be non-SMA practitioners (P=0.001). (Table 2) TPB was used to analyze the participants' behavior, which revealed that the SMA group had a statistically higher positive attitude toward the SMA practice (P=0.02). The SMA group's subjective norms were statistically higher in terms of accepting the SMA practice (P <0.001). In addition, the SMA group's perceived behavior control was statistically higher in terms of accepting the SMA practice. (P < 0.001). Participants` intentions to practice SMA among the SMA group were higher (P < 0.001). (Table 3)

Table (4): Logistic regression for the factors that affect self-medication with antibiotics

Factor	B	OR	95% CI	P value
Age	-0.3	0.9	0.95 to 0.99	**0.03**
Internet use for getting medical information:				
No*		1		
Yes	0.9	2.6	1.4 to 4.9	**0.02**
Received health education about COVID-19				
Yes*		1		
No	0.8	2.1	1.1 to 4.1	**0.03**
Knowledge about SMA:				
Poor or Moderate*		1		
Adequate	- 0.4	0.4	0.8 to 2.7	0.3
Health insurance:				
No*		1		
Yes	0.5	0.2	0.5 to 5.1	0.07
Attitude:				
Negative*		1		
Positive	0.6	1.7	1.9 to 3.3	**0.005**
Subjective norms:				
Negative*		1		
Positive	0.9	2.9	1.4 to 4.9	**0.003**
Perceived behavioral control:				
Negative*		1		
Positive	1.2	3.5	1.9 to 6.4	**0.002**
Intention:				
Not intender*		1		
Intender	0.9	2.5	1.7 to 3.6	**0.003**

**Reference group, P-value is significant if < 0.05, Model chi square=7.9, Hosmer and Lemeshow test= 5.2, p-value=0.74, % correctly predicted = 92.4*

Positive perceived behavioral control (OR 3.5, P= 0.002), having positive subjective norms (OR 2.9, P= 0.003), having an intention to practice SMA (OR 2.5, P=0.003) and positive attitude (OR 1.7, P= 0.005) were the most influencing factors in SMA practice. Other characteristics such as internet use for getting medical information (OR 2.6, P= 0.02), lack of health education about COVID-19 (OR 2.1, P= 0.03), and younger age (OR 0.9, P= 0.03) were also found to be the most influential factors in SMA practice. (Table 4)

DISCUSSION

Self-medication with antibiotics is malpractice that could lead to an increased rate of antibiotic resistance due to inappropriate antibiotic use. This problem was exacerbated during the COVID pandemic as most people were aware of the treatment protocol which included the use of antibiotics such as azithromycin was announced by the Egyptian Ministry of Health and Population (MOHP). This protocol has been widely

disseminated on social media and broadcasted on TVs. So, Egyptian people have depended on their knowledge of the protocol and used the mentioned drugs without their doctors` prescriptions.

In this study, about 38% of the studied participants self-medicated with antibiotics. This prevalence was similar to that reported in the study of Sari et al, in Indonesia[17] during the COVID-19 pandemic which showed that 57% of the studied 110 participants practiced SMA. In another study in Nigeria during the pandemic,[14] the prevalence of self-medication was 41%. Unlike the study of Acharya et al[18] which reported that only 8% of the participants did SMA. This disparity could be attributable to the strict regulations in dispensing antibiotics in Nepal.

More than half of the participants reported using erythromycin and chloroquine while about one-third of the participants self-medicated with doxycycline, chloramphenicol, metronidazole, ciprofloxacin, and levofloxacin in this study. This was supported by a study conducted by Nassir et al who found that 54.2% of their participants used macrolides without a prescription from their doctors.[19] These percentages are considered high when compared with the study of Wegbom et al.[14] which reported that only 5.3% of their participants self-medicated with erythromycin and only 3.2% used chloroquine. This can be explained that the Egyptian MOHP protocol used erythromycin and chloroquine for a long period after the COVID-19 pandemic erupted. Following the protocol modification, the information was not communicated to the public who depended on the earlier protocol.

Most participants in this study avoided attending the healthcare facility for fear of contracting COVID-19. This was in line with the study of Mudenda et al[20] which reported that people in Zambia stopped visiting health facilities due to the fear of COVID-19 infection.

The participants also reported that they found it difficult to get healthcare services because of the long distance to the nearest facility, the long waiting time to see their doctor as they were busy due to the work overload, and the medical staff limitation by sick leaves due to infection, the excessive cost of healthcare services. These were important reasons for the participants to self-medicate.

Similarly, a study conducted on 924 participants in Saudi Arabia reported that half of them found it difficult to reach a hospital. So, they practiced SMA.[21] Also, another study conducted in Kerala, India showed that people used to self-medicate with antibiotics due to the expensive fees of doctor's consultation.[22]

SMA was also claimed to be practiced due to severe COVID symptoms and an easily accessible pharmacy. This was consistent with the study of Mudenda et al[20] which found that the more the severe symptoms and easily obtained antibiotics from pharmacies or kiosks, the higher the SMA practice. This was in contrast with a study conducted in the study of Al-Ghamdi et al[21] which found that the participants practiced SMA because they believed that their symptoms were too trivial to seek medical advice. This can be justified that the participants sought medical advice from trusted pharmacists believing that the faster they got the antibiotic, the faster they would recover.

Antibiotics were obtained by about half the participants from the pharmacy, leftovers at home, and a family member or a friend. This was in line with a study conducted in Bangladesh [23] which found that pharmacies (51.4%) were a common source of obtaining antibiotics, but they used leftovers from previously used antibiotics (7%), and family and friends (2%) in a lower percentage. They reported their low percentage of leftovers and getting the antibiotics from family and friends because they adopted the single unit dose in the antibiotic dispensing which is different in Egypt as the antibiotic dispensing by the whole course package with a tendency of practicing incomplete courses, so home leftovers and family and friends were common sources of antibiotics.

Fever and respiratory symptoms were the most common symptoms that drove the participants to self-medicate with antibiotics. Participants who self-medicated with antibiotics were those who suspected COVID infection. As a result, they rushed to self-medicate with antibiotics in the hope of preventing or reducing the disease severity. A qualitative study of antibiotic-seeking behavior by Kalam et al. found that once fever or respiratory symptoms appeared, respondents rushed to take their previously known antibiotics based on their expectation of quick recovery linked to the earlier use of antibiotics in case of COVID-19 suspicion.[23]

SMA practice was shown to be common among the younger participants and those who had poor knowledge about SMA as found also in the Saudi Arabian study[21] which showed a high statistically significant difference ($p<0.001$) across different age groups, with SMA being more common among the

younger age group. Another Saudi Arabian study[24] also found that participants with adequate knowledge about SMA were less likely to practice this behavior.

Another factor that affected the practice of SMA in this study was internet use to get medical information. This agreed with the findings of Mendosa et al[25] which found that the use of the internet, particularly social media, during the quarantine played a direct role in expanding the practice of SMA since people relied on it to get their information which was not reviewed nor updated.

The participants who did not get health education about COVID-19 and those who suspected COVID symptoms were more likely to engage in SMA. This was in concordance with the study conducted in Nigeria by Akinnawo et al[26] that found a statistically significant link between the knowledge and experience of COVID symptoms and the practice of SMA.

Using logistic regression, it was found that participants of older age had a protective predictor of antibiotic self-medication which matched a study conducted by Zhang et al. in Australia on the use of SMA for protection against COVID-19 infection.[12]

This contrasted with a study conducted in Southern Nigeria which found that the older participants practiced SMA more often. It was explained that they had more comorbidities like hypertension and DM which are more susceptible to the adverse outcomes of COVID, thus they used antibiotics without a prescription to protect themselves.[26]

In the present study, poor health education about COVID was identified as an independent predictor for SMA practice which was also reported by the study of Okoye et al. and Tekeba et al.[27,28]

The current study showed that the constructs of TPB played a more significant role in predicting the factors that impact SMA practice. This is consistent with the findings of Karimy et al and Elmahi et al.[29,30] which showed that all constructs especially perceived behavioral control had a crucial contribution in predicting the SMA practice. The participants supported practicing SMA as being a more convenient, easier, cost-effective, and successful practice.

In a qualitative study conducted in Indonesia[31] describing people' beliefs towards SMA based on TPB, they found that when the respondents showed negative behavior towards SMA, their practice and intention to do so could be reduced. The results showed that the respondents found SMA advantageous in terms of saving time and money but the disadvantages they reported were poor health outcomes and antimicrobial resistance.

Insufficient knowledge regarding SMA and a positive attitude toward accepting SMA practice were crucial predictors of SMA practice. This was in line with the study conducted in China by Zhu et al. which revealed a lack of information about SMA and positive attitude toward SMA practice were independent SMA predictors.[32]

This community-based study represented the behavior of SMA in a village selected by a multistage technique. It included all individuals with both appropriate and inappropriate seeking behavior who were selected through a systematic random sampling technique. The different methods of sample selection support the generalizability of the results. Also, this study was also the first to address this issue in Egypt during the pandemic. The main challenge for this study was the data collection during the pandemic. People were afraid to participate as they did not want to get contracted to the data collectors who were healthcare providers, in case they got infected from them. This was overcome by the strict adherence to the infection control procedures when dealing with the participants.

CONCLUSION:

Antibiotic self-medication is on the upsurge during the COVID-19 era for a variety of reasons, including healthcare facilities, doctors, and medication accessibility. The participants` behavior in terms of attitude, subjective norms, perceived behavioral control and intention all have a significant impact on SMA practice.

Recommendation

As there are daily changes in the lines of management, it is highly suggested that health literacy be provided to the people regularly to keep them informed about health information as it relates to a newly emerging disease such as COVID-19. Also, educational campaigns are recommended to raise awareness about the risks of antibiotic self-medication such as misuse or antibiotic resistance. The over-the-counter dispensing of antibiotics from pharmacies must be strictly controlled. Controlling the dose of administered antibiotics is also recommended to avoid having leftover medicines at home. The constructs of the theory of planned behavior are vital predictors that can be improved to change the public beliefs about SMA.

Ethical Approval

The study was approved by the Research Ethics committee in Menoufia Faculty of Medicine. All participants were voluntarily involved in the study after being informed about the study objectives, ensuring confidentiality, and obtaining informed consent from them. Official permission was obtained from the local administrative authority of the village.

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