Awareness of Counterfeit Medicine among Saudi University Students

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Authors' contributions

This work was carried out in collaboration among all authors. Authors BTA and IMA contributed equally to this work. Authors BNA and ASA contributed to data analysis, drafting or revising the article. All authors read and approved the final manuscript.

Original Research Article

ABSTRACT

Background: Lack of knowledge and awareness of the society is one of the major contributing factors to the prevalence of counterfeit medicines in a country. There is limited information in the developing countries on university student's facts concerning counterfeit medicines.
Aim: To assess how the university student either in medial or non-medical colleges identify counterfeit and substandard medicines and to evaluate their vulnerability level toward counterfeit drugs.
Methods: Structure electronic questionnaire was distributed in Saudi Arabia, between December 2020 till March 2022. The sample included 1216 respondents selected conveniently from two distinct groups (Student in either medical or non-medical colleges). 1204 participants who were fluent in either English or Arabic were included. The objective of this study is to give better understanding of counterfeiting in drugs and how to fight it.
Results: From one thousand two hundred and sixteen questionnaires were distributed to university student both medical college and non-medical college, only 12 were refused to participate, which indicate higher in response rate. 85% of the answers were female, 36% below 20 and 92% of them were Saudi citizen wit 67% single state. Most of the results of the survey (38 items) were insignificant (p-value>0.05) only 13 (34%) question of the survey relived significant. So, more awareness towards counterfeit medicines, in the level of university student will needed reduce the lack of knowledge.

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Conclusion: Although medical school students have higher knowledge about counterfeit drugs, nevertheless, the overall findings suggested low-level of knowledge, exposure to counterfeit were estimate in both medical and non-medical college students in most of the surveyed items.

1. INTRODUCTION

Counterfeiting is an effort to copy and marketing inferior goods through matching the style, design, and packaging of more expensive brands and offering them at a lower price for a consumers [1-3].

In the last two decades' drug counterfeiting has become a global public health problem causing death, disability, injury, and loss of public confidence in the health care system. It also wastes precious human and financial resources, and constitute an enormous problem facing global pharmaceutical industry [3,4]. The definition and classification of counterfeiting and/or substandard medicines (drugs) which become a worldwide phenomenon is still in continuous updating [3,5-8]. Definition of counterfeit according to the World Health Organization (WHO), a counterfeit medicine is defined as: "one which is deliberately and fraudulently mislabeled with respect to identity and/or source [9]. Both branded and generic products could be counterfeit, they may contain; products with the correct and/or wrong ingredients, products without the active ingredients, products with insufficient or overdose active ingredient, products with false packaging [9]." Substandard medicines, also referred to as out-of-specification products, are defined by the WHO as "products that do not meet the required specification in terms of content and ingredients [10]." Recently, the term substandard/spurious/falsely labeled/falsi-fied/counterfeit medicines (SSFFC) was used by the WHO to simultaneously describe both counterfeit and substandard medicines. The predictions extent of the SSFFC it is so challenging but it is estimated to be ranged from 5-10% of the global market [11,12], rising to 25% in Least Developing Countries (LDCs) [13,14]. These estimations presenting wide scale of the phenomenon not only in the volume but also in the area covered and medicines replicated as well.

Although, there is no official reports on the scale of counterfeit medicines distribution in the Saudi market, but in 2014 the number of counterfeit products (electronic, fashion, medicine, foods, cosmetics, etc..) exceeded US\$ 62 million in ports [8].

This study was designed to investigate the awareness of the university students either in medial (medicine, pharmacy, dentists, medical allied) or non medical colleges (others); how they identify counterfeit and substandard medicines and to evaluate their recognition level toward counterfeit drugs. To the authors knowledge, there have been no studies yet to explore counterfeit medicines responsiveness in Saudi Arabia.

2. METHODS

This study was conducted through a process of collecting surveys in Saudi Arabia, Riyadh, between December 2020 till March 2022. Structure electronic survey was carried out consisted of fifty-two questions, and was distributed to random sample of undergraduate student in King Saud University. Sample included 1204 respondents selected conveniently from two distinct groups: university student in medical and non-medical students. All medical and non-medical students who were fluent in either English or Arabic and agreed to be interviewed were included in the study. The survey questionnaire was developed in two languages i.e., English and Arabic.

2.1 Statistical Analysis

Collected data was statistically analyzed using SPSS version 22.0 (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.). Both descriptive and inferential statistics were applied. Chi-square test and two sample t-test were used for statistical analysis at p-value of 0.05.

3. RESULTS

3.1 Demographic Characteristics

Electronic surveys were distributed among university students either they belong to medical

or non-medical colleges in King Saud university, 1216 response were received, 12 were refuse to participate, which indicate higher in response rate (99.34%). Female student were the most participants almost 85.% of the responses Table 1), 21 % were below 20 years of age and 92% of them were Saudi citizen with 66.78 % single state. All these data accounted for undergraduate student in university level.

3.2 Experience towards Counterfeit Medicines

Thirty-eight questions have been investigated regarding counterfeit medicine were asked, Table 2 presents the questions and the answers as well as the p-value showing whether or not a significant difference exists between the two groups under studies.

Direct questions were asked to both medical and non-medical students in the way they perceive counterfeit medicines to investigate about their knowledge to the term and definition of counterfeit medicines. The results indicate higher level of knowledge about the term and the definition of the counterfeit medicine as seen in questions from 1-13, with no significant differences among medical students and non medical student's groups. Only two questions out of the thirteen questions reported a significant difference. For the statements, "The term "counterfeit medicine" includes products with insufficient Ingredients". As well as the statement "Have you heard about recall medicines?" Can be negligible since recall is authority

(manufacture or distributor of the medicine) should take action and the question was not related to the definition of counterfeit.

Additionally, Table 2, question from 15-20, discoursed the sources counterfeit medicine, does it related to manufacture, packaging, storage or language as well as does the price and/or the availability of online buying medicine were sources of medicine counterfeit. The results obtained revealed no significant differences among medical students and non-medical students groups except for the statement that online shopping can be a source of administration of the counterfeit medicine.

Moreover, high knowledgeable were exposed towards side effects towards administering counterfeit medications in both medical and non-medical school students (questions 21-25, Table 2). No significant difference was observed if the counterfeit medicines can cause serious side effects, or be dangerous to health, can cause allergic reactions. Although there was a significant difference was observed in the statement of does counterfeit medicine can cause treatment failure or can promote medicine resistance.

Additionally, in relation to purchasing medicine online, there was no significant difference was observe in both medical and non-medical school students (questions 26-30, Table 2). Except that one significant difference appears which that medical student can bought medicine from online.

Table 1. Demographic characteristics of the student participate in the questionnaire

Statements	Number (%)
Sex	
Male	180 (14.95)
Female	1024 (85.05)
Age (years)	
<20	248 (20.59)
20-25	956 (79.41)
Nationality	
Saudi	1104 (91.69)
Non-Saudi	100 (8.31)
Marital status	
Single	804 (66.78)
Married	400 (33.22)
Occupation status	
Student in medical field	716 (59.47)
Student in non-medical field	488 (40.53)

Moreover, there were a significant difference was observed in both medical and non-medical school students (questions 31-35, Table 2) in correlation to protection against buying counterfeits medicines by only buying prescription medications from a licensed pharmacy, being familiar with the medications take, never purchasing prescription medicine without prescription, never purchasing medicine from a foreign website and if you subjected a counterfeit medicine, you should report it to the Saudi Food and Drug Authority.

Lastly, there were a no significant difference was detected in both medical and non-medical school students (questions 36-38, Table 2) is association the problem of counterfeit medicine has real threat in developing countries only. This problem is detected also in Saudi Arabia and you should share this information with your family and friends as well.

Although medical students have higher awareness than non-medical students but the overall analysis of the data showed that there was a no significant difference among medical and non-medical students in most of the surveyed items (p-value≥0.05, 66%). However, results revealed a significant difference (p≤0.05) for thirteen questions only (34%, Table 2).

Table 2. Comparisons of undergraduate students in either medical or non-medical schools about their understanding of counterfeit medications

Statement	Yes n (%)	No n (%)	Not sure n (%)	p-value
1. Are you familiar with the term fake, falsified, counterfeit medicine.				
• Student in medical field	620	96	0	0.874
• Student in non-medical field	420	68	0	
2. Have you heard about recall medicines.				
• Student in medical field	648	68	0	0.000
• Student in non-medical field	360	128	0	
3. The term "counterfeit (fake) medicine" describe unsafe medicine				
• Student in medical field	514	74	134	0.458
• Student in non-medical field	374	26	82	
4. The term "counterfeit (fake) medicine" describe medicine that's not effective.				
• Student in medical field	368	180	168	0.230
• Student in non-medical field	200	136	152	
5. The term "counterfeit (fake) medicine" describe medicine that's illegal.				
• Student in medical field	536	128	52	0.114
• Student in non-medical field	360	60	68	
6. The term "counterfeit (fake) medicine" describe medicine that's without a proper authorization.				
• Student in medical field	504	112	100	0.807
• Student in non-medical field	336	68	84	
7. The term "counterfeit (fake) medicine" describe medicine that has fake packaging				
• Student in medical field	468	120	128	0.222
• Student in non-medical field	268	92	128	
8. The term "counterfeit (fake) medicine" describes medicine that is contaminated with foreign materials, even the toxic ones				
• Student in medical field	400	152	164	0.744
• Student in non-medical field	248	100	140	
9.The term "counterfeit (fake) medicine" describe medicine that's Expired (out-of-date)				
• Student in medical field	128	476	112	0.373
• Student in non-medical field	112	284	92	
10.The term "counterfeit (fake) medicine" describe medicine that's labelled incorrectly				
• Student in medical field	276	276	164	0.744
• Student in non-medical field	168	148	136	
11.The term "counterfeit medicine" includes products with wrong ingredients				
• Student in medical field	420	152	144	0.434
• Student in non-medical field	272	88	128	
12.The term "counterfeit medicine" includes products without active ingredients				

• Student in medical field	372	176	168	0.260
• Student in non-medical field	212	152	124	
13.The term "counterfeit medicine" includes products with insufficient Ingredients				
• Student in medical field	408	156	152	0.014
• Student in non-medical field	196	140	152	
14.Have you ever seen a counterfeit drug.				
• Student in medical field	124	488	104	0.000
• Student in non-medical field	48	376	64	
15.Manufacturing can be a source of counterfeit medicines				
• Student in medical field	484	52	180	0.325
• Student in non-medical field	336	16	136	
16.Packaging can be a source of counterfeit medicines				
• Student in medical field	480	108	128	0.121
• Student in non-medical field	260	64	164	
17. Storage can be a source of counterfeit medicines.				
• Student in medical field	280	236	200	0222
• Student in non-medical field	216	124	148	
18. Language of the instruction leaflet can be a source of counterfeit medicines				
• Student in medical field	300	140	276	0.744
• Student in non-medical field	172	96	220	
19. Medicine price can be a source of counterfeit medicines				
• Student in medical field	364	160	192	0.136
• Student in non-medical field	212	92	184	
20. Online pharmacies can be a source of counterfeit medicines				
• Student in medical field	512	36	168	0.008
• Student in non-medical field	288	119	132	
21. Fake medicines can cause a serious side effects				
• Student in medical field	616	4	96	0.708
• Student in non-medical field	420	0	68	
22. Fake medicine can cause treatment failure				
• Student in medical field	640	4	72	0.000
• Student in non-medical field	408	4	76	
23.Fake medicines can be dangerous to your health				
• Student in medical field	692	4	20	0.134
• Student in non-medical field	448	0	40	
24. Fake medicines can cause allergic reactions.				
• Student in medical field	612	0	104	0.700
• Student in non-medical field	404	0	84	
25. Fake medicines can promote medicine resistance				
• Student in medical field	308	76	332	0.023
• Student in non-medical field	148	88	252	
26. Do you buy medicines online				
• Student in medical field	252	572	0	0.029
• Student in non-medical field	64	424	0	
27. Have you encountered a problem with medicine when you buy it online				
• Student in medical field	324	424	0	0.000
• Student in non-medical field	232	224	0	
28.Saving time is a reason that could lead you to buy medicines online				
• Student in medical field	316	400	0	0.690
• Student in non-medical field	204	284	0	
29.Saving money is a reason that could lead you to buy medicines online				
• Student in medical field	424	292	0	0.309
• Student in non-medical field	260	228	0	

30. Access to other medicines is a reason that could lead you to buy medicines online				
• Student in medical field	376	340	0	0.207
• Student in non-medical field	220	268	0	
31. You can protect yourself from counterfeits by only buying prescription medications from a licensed pharmacy				
• Student in medical field	648	24	44	0.000
• Student in non-medical field	424	12	52	
32. You can protect yourself from counterfeits by being familiar with the medications you take				
• Student in medical field	616	24	84	0.008
• Student in non-medical field	424	8	56	
33. You can protect yourself from counterfeits by never purchasing prescription medicine without your doctor's prescription				
• Student in medical field	574	246	96	0.012
• Student in non-medical field	148	76	64	
34. You can protect yourself from counterfeits by NOT purchasing medicine from a foreign website				
• Student in medical field	616	188	162	0.004
• Student in non-medical field	132	44	62	
35. When you purchased a counterfeit medicine, do you report it to the Saudi Food and Drug Authority				
• Student in medical field	564	152	0	0.000
• Student in non-medical field	384	104	0	
36. Counterfeit medicines are a threat in developing countries only				
• Student in medical field	228	320	168	0.082
• Student in non-medical field	136	180	172	
37. Do you believe that counterfeit medicines are a serious problem in Saudi Arabia				
• Student in medical field	420	104	192	0.107
• Student in non-medical field	344	48	96	
38. Will you share this information with your family and friends				
• Student in medical field	632	184	0	0.352
• Student in non-medical field	112	76	0	

Table 3. Comparisons of undergraduate medical students' and non-medical students' knowledge of fake medications

Statements	Medical student's n (%)	Non-medical student's n (%)	Total n (%)
41. What do you instinctively think of when you hear the word "counterfeiting"			
Spare parts	108	44	152
Medicine	100	52	152
Electronics	124	80	204
Luxury products	120	64	184
Fashion brand	264	248	512
42. What are the sources of your pharmaceutical knowledge			
Pharmacist	244	76	320
Doctor	120	124	244
Internet	244	200	444
Other	108	88	196
43. Which organization is responsible for recall medicines			
Mi3nistry of health	72	68	140
Saudi Food and	624	412	1036

Drug Authority Manufacture of the medicine	20	8	28
44. If you had seen a counterfeit drug, where?			
Frined-neigher	640	276	916
Health Center	196	28	224
Private Hospital	64	0	64
45. How can you distinguish Fake medicine from original			
The quality	132	104	236
The price	48	20	68
The warranty	52	44	96
The place	132	120	252
You can not	352	200	554
46. Which type of medicine is target for manipulating (cheating)			
Antibiotics	4	16	20
Palliative medicines	100	68	168
Anti-diabetics	4	0	4
Anti-hypertensives	12	0	12
All types of medicines	596	408	1004
47. In your opinion why people purchase fake medicines			
Low Price	304	172	476
Easy to find in any where	24	44	68
I did NOT know they were counterfeited	352	256	608
No reason	36	16	52
48. If you had buy medicines online. How many times?			
More than once per month	72	48	120
Once	384	244	628
Once per month	96	48	144
Once per year	288	24	312
49. When you bought medicines online			
You felt like you were taking a risk, you never really know what you're buying online	480	244	724
You felt save, as if you were buying from a physical shop	360	120	480
50. How do you rate your knowledge about counterfeit medicine			
Excellent	132	88	220
Good	408	288	696
Poor	176	112	288

4. DISCUSSION

The study revealed that students belong to medical school have perceived high enough knowledge for the counterfeit than other non medical school students. Demographic factors (gender, age, nationality and marital status) have no correlation effect during this study since it is cultural context [15].

Although medical students have higher awareness than non-medical students but the overall analysis of the data showed that there was a no significant difference among medical

and non-medical students in most of the surveyed items (p-value≥0.05, 66%). However, results revealed a significant difference (p≤0.05) for thirteen questions (34%, Table 2). It is obvious for the non-medical students to have low knowledge and awareness about the existence of counterfeit medicines in the market. This may highlight the prominence of educating and raising the awareness of public about the problem of counterfeit medicines either all countries including developed world.

Several published articles were obtained with sectional questionnaire-based study on knowledge and exposure to counterfeit drugs [16-18] showed that although the knowledge and awareness of counterfeit is high among workers in medical field but still insufficient, these studies were carried out in India, Saudi Arabia and European countries respectively.

Although this questionnaire reaches some conclusion, long study duration, larger sample size and more subject selection are required to generalized the study conclusions.

5. CONCLUSION

Three important values should be available for patient treatment; medicine safety, efficacy, and quality. This study publicized that medical school students have higher awareness and knowledge about counterfeit than non-medical students but the overall analysis of the questionnaire showed that there was a no significant difference among medical and non-medical students in most of the surveyed items.

The most major concerns that encouragement occurrence and accessibility of counterfeit medicine was the insufficient knowledge about counterfeit/substandard medicine in the medical and non-medical school students level. Proper distribution of the knowledge, awareness utilizing several modern technological approaches (school teaching, social media) can be helpful in diminution of counterfeit medications as well as other counterfeit other products (electronics, cloths, jewelry, etc.) among the population are needed.

CONSENT AND ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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