Academia Journal of Educational Research 5(9): 000-000, September 2017
DOI: 10.15413/ajer.2017.0941
ISSN 2315-7704

Academia Publishing

Research Paper

Appropriateness assessment and identifying the risk factors of oral non-prescription drugs' use among university students in the United Arab Emirates

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Accepted 18th September, 2017

ABSTRACT

Irrational use of drugs has a serious impact on health and the economy. The use of oral non-prescription drugs is increasing among university students worldwide. The objective of the present study is to measure the prevalence of use of oral-non-prescription drugs, assess appropriateness of this use, and identify factors associated with inappropriate use among students. A cross-sectional study used anonymous self-administered questionnaire over the period of four months (January, 2014 to April, 2014). More than half (1348; 57%) of participants reported the use of ONPD in the past 90 days before study commencement. Of 1,348, participants reported using ONPD; only 8% were inappropriate ONPD users for self-treating the last recent symptom. The present study identified three newly reported risk factors for the outcome. Polypharmacy behaviour was a significant predictor variable (OR = 2.457, 95% CI: 1.380-4.373, p=0.002), safety belief in the use of ONPD (OR= 1.702, 95% CI: 1.070-2.709, p≤0.05) and medication knowledge (OR= 0.608, 95% CI: 0.380-0.972, p≤0.05). There is high prevalence of ONPD use among university students in UAE. However, the majority of this use was found to be appropriate. To promote healthy ONPD use in university students, awareness campaign is needed in all universities and must stress on the potential dangers of drug addict, drug abuse and polypharmacy behavior.

Keywords: ONPD, inappropriate use, polypharmacy, University students, UAE.

INTRODUCTION

The appropriate use of NPDs in self-medication has multiple benefits for both the patient and the community. At the user level, appropriate self-medication with OTC-drugs empowers people to take care of their own health (Huges et al., 2001; WHO, 2000; Ruiz, 2010). It is also a way of giving the patient fast and direct access to disease management, which can be particularly important in terms of contraception (Ruiz, 2010). Self-medication with NPD can provide quick pain relief until further medical evaluation is acquired (Ruiz, 2010; Pandya et al., 2013; Sharif and Sharif, 2014).

The use of ONPDs is beneficial in terms of cost, particularly in countries that have a nationalized health service (Ruiz, 2010; Hughes et al., 2001). The prevalence of ONPDs use in self-medication practices among students at the university level is considered high across the world including United Arab Emirates (UAE) (Sawalha, 2008; Sharif et al., 2012; Pandya et al., 2013). One of the recommendations to reduce medication errors and harm is to use the "Five Rights 5R": the right patient, the right drug, the right dose, the right route and the right time (Federico, 2016; Grissinger, 2010). For safe and effective use of ONPDs, there are a number of tasks that must be performed by drug consumers that are usually carried out by a physician. These include: accurate self-diagnosis of the symptoms, appropriate selection of a drug along with the appropriate dosage and dosage schedule and consideration of multiple drug use (WHO, 2000).

Studies measured appropriate ONPDs use among students based on four criteria namely type of drugs, dose and frequency of use and duration of treatment (James et al., 2006, 2008). Other study measured appropriate drug use based on pharmacological indicators such as paracetamol appropriate to be used in fever, headache, general body pain, toothache or sore throat but unnecessary for other ailments (Sclafer et al., 1997). No study to date has explored inappropriate ONPD use among United Arab Emirates (UAE0 Higher Education Institution students).

UAE students may be at risk of inappropriate ONPDs consumption because students in general have high rates of OTC-drug usage (Ali et al., 2010). The present study aims at measuring the prevalence of ONPDs use, assessing the appropriateness of this use and identifying risk factors associated with inappropriate ONPDs use among university students in UAE.

MATERIALS AND METHODS

Ethical consideration

The present study was conducted after the approval of the institutional Ethics Committee in UAE and Gloucestershire University, UK.

Study design

A cross sectional study was conducted among the students of major universities in UAE from January to April, 2014. A multistage sampling technique was used in the present study. In step 1, three universities (out of five UAE universities that offer medical and non-medical programs) were randomly selected. In step 2, three medical and non-medical colleges from each university were selected by stratifying on medical and non-medical colleges and then a simple random sampling technique was used to select one-college from medical and two colleges from non-medical colleges within each university. In step 3, random sample from each year of program were selected using simple random table.

Prior to participation in the study, all potential participants were informed about the aim of the study and their right to refuse participation or withdraw from the study. Students consent was taken before participating in the study.

Study population

Specified precision method was used to determine the sample size for this study. The desired level of confidence was set at 95% and the desired level of precision was set at 0.03 on either side, such that the estimated proportion of inappropriate use was within 3% (for example, 47 to 53%). The following formula is applied (Ali et al., 2010):

$$n = (Z2 \times P\ (1 - P))/e2$$

Where Z = value from standard normal distribution corresponding to desired confidence level (Z=1.96 for 95% CI), P= expected true proportion, e = desired precision (half-desired CI width).

A sample size of at least 1,068 ONPD users was needed. Assuming that the prevalence of ONPD use was 37.7% among students (Sawalha, 2008) to acquire 1,068 ONPD users, a total number of 2,833 students would be required. The present study distributed the questionnaire to 3,346 students and identified 2,875 eligible students, giving a response rate of 85.9%. A total of 471 students were excluded, as they have had no prior experience ever with the use of ONPD. Furthermore, 356 students were unwilling to participate in the study and only 2,519 students were identified as both ONPD user and non-user in the past 90 days before the study. Of 2,519 participants, 164 student's surveys were excluded due to incomplete status or the fact that most of outcomes variables were not answered. Of 2,355 completed surveys, 1,007 respondents reported that that they have not used ONPD during the past 90 days before conducting the study. The remaining 1,348 ONPD users in the past 90 days were collected and analyzed throughout the study period.

Questionnaire development

A self-administered questionnaire was used in this study. The questionnaire was constructed and developed based on Andersen behavioral model that guided the present study (Andersen and Newman, 1973). The questionnaire comprised of three types of questions divided into three categories: predisposing factors, enabling factors and need factors; accordingly, the survey ended up with more than 40 explanatory variables. Independent variables were grouped into predisposing factors (3 demographic characteristics, 1 social structural characteristic and 15 health belief characteristics), enabling factors (colleges, year of study, OTC- knowledge, medication knowledge, source(s) of ONPD - information, income and employment) and need factors (self-care orientation and perceived-health). The survey was completed in a paper-and-pencil survey instead of an online form. The researcher provided a personal introduction and briefing of the study, informing the students of the nature of the study, the purpose of the study and the expected time to complete the questionnaire. All the students within the classes were invited to participate with informed consent, if they met three criteria: (1) being 18 years of age or older, (2) had previous experience using ONPD and (3) had not already taken the survey while attending another class. Based on this review, five assessment criterion were identified

namely self-diagnosis, self-selection of ONPD, dose, frequency of use and food-drug administration.

In order to validate the assessment criteria of ONPD use, a panel of ten experts from an internationally accredited hospital in Dubai was selected. Four questions were used to test face -validity of the measuring instrument of the appropriateness of ONPD use and if the tool is valid to measure appropriateness of ONPD use and if there is any criteria must be added or removed from the tool. The panel members were informed of the nature, the purpose of the study and the expected time to answer the four questions. Informed consent to participate in the study was obtained. The panel agreed that the measuring instrument is face in that the tool is measuring what it supposed to measure. Then, eight out of ten participants agreed that the tool is content valid in that each item is clearly measuring the construct of interest and there is no additional criterion added to the tool. One university out of the three randomly selected universities was selected to conduct a pilot study to test the clarity of the survey. Pilot study was conducted over two steps and surveyed 100 students. In the first phase, 80 students across colleges at the target university were surveyed to determine the clarity and simplicity of the questions, the duration to answer the questionnaire and identify questions or response options that required modification or removal. After the survey was modified following the first phase, phase two was conducted where 20 students were surveyed to assess the re-modified survey instrument.

To determine inter-rater reliability of the measurement tool, two experts out of the ten experts who participated in the validation panel agreed to participate in the inter-rater reliability assessment. Each of the two physicians independently reviewed same 50 responses from the pilot study to determine the appropriateness of the ONPD use based on the five agreed upon criteria. The Kappa measure of agreement was 0.737, which represents good agreement between the two ratters (Howell, 2011).

Data analysis

The participants' responses were encoded for their demographic details; reasons for self-medication, commonly used ONPD, their knowledge, attitudes, beliefs and behaviors towards self-medication practice of ONPD. The data was analyzed using Statistical Package for the Social Sciences (SPSS, version 20, Chicago, IL, USA). Descriptive statistics was used to describe the study variables using frequencies and percentages. Chi-square test was used to identify any significant difference among the participants' responses regarding certain statements in the questionnaire with a significant level of $p<0.05$. Binary Logistic Regression (BLR) was conducted to identify risk factors of inappropriate ONDP use and to compute odd ratio.

RESULTS

Only 2,355 surveys were returned completed and included in the study over the study period. Among the 2,355 students participated in this study, the majority were females (1,797; 76.3%), single (2,151; 91.3%), and not employed during the study period (2,190; 93%). The majority of the participants (2,158; 91.6%) were at the age group of 18 to 23 years (Table 1). More than half (1,348; 57.2%) of the participated students reported using ONPD in the past 90 days before conducting the study and were asked to complete the survey.

The overwhelming majority (1,240; 91.9%) of the participants were appropriate ONPD users for self-treating the last recent symptom they experienced prior to the study. The highest proportion of inappropriate ONPD users violated only one assessment criterion (90.9%), of which more than half (59.2%) selected inappropriate drugs. Few of the inappropriate ONPD users (1.8%) violated three assessment criteria. Table 2 shows the distribution of the assessment criteria among inappropriate users (n=108).

Headache was the most commonly reported symptom for nearly half of the ONPD users (626 of 1,348; 46.4%) followed by menstrual pain (203 of 1,348; 15.1%) and common cold (145 of 1,348; 10.8%). These symptoms are usually easy to self-diagnose which means that almost three-quarters of the users (72.3%; 974 of 1,348) satisfied the first criterion for appropriate drug use.

Paracetamol (Panadol®) was the most commonly used drug (894 of 1,348; 66.3%), followed by, Ibuprofen, Brufen®, (141 of 1,348; 10.5%). Both of which are usually appropriate for treating most types of headache (BNF, 2012: 285) and providing adequate pain relief of dysmenorrhoea (BNF, 2012: 268, 667); therefore, more than three-quarters of the users (76.7%; 1,035 of 1,348) satisfied the second criterion. The vast majority of paracetamol users also took only one tablet (500 mg); the recommended dose is 500 mg to 1 g (BNF, 2012: 270); two-thirds of the users (66%; 894 of 1,348) satisfied the third criterion. The overwhelming majority of the users took paracetamol only two to three times daily [can be taken every 4 to 6 h, if needed, to a maximum of 4 g in every 24 h (BNF, 2012: 270)]; two-thirds of the users (66%; 894 of 1,348) satisfied the fourth criterion. Regarding the fifth criterion (food-drug interaction), there is no recommendation that paracetamol be taken with or without food (FDA and NCL, 2013: 6; Bobroff et al., 2009: 6); two-thirds of the users (66%; 894 of 1,348) therefore satisfied the fifth criterion. In summary, two-thirds of the users (66%; 894 of 1,348) used an ONPD appropriately to treat their most-recent symptom.

Brufen® has to be taken after food to avoid stomach upset (FDA and NCL, 2013: 7; Bobroff et al., 2009: 7). A minority of users (1.3%; 18 of 1,348) used ONPD inappropriately, but they only violated the fifth criterion. Furthermore, antibiotics were used without prescription

Table 1: Demographic characteristics of the participants (n=2355).

Demographics	N	Percentage (%)	95% CI	
			Lower	Upper
Age				
18-20	1033	43.8	41.9	45.9
21-23	1125	47.8	45.7	49.8
24-26	171	7.3	6.2	8.4
27-29	12	0.5	0.3	0.8
≥30	14	0.6	0.3	0.9
Gender				
Female	1797	76	74.6	78.0
male	558	24	22.0	25.4
Marital Status				
Single	2151	91.3	90.2	92.4
Married	186	7.9	6.9	9.0
Divorced	11	0.5	0.2	0.8
Others	7	0.3	0.1	0.6
Ethnicity				
UAE National	1073	45.5	43.5	47.6
Arab	1068	45.4	43.4	47.4
Asian	86	3.7	2.9	4.4
Iranian	88	3.7	3.0	4.5
Others	40	1.7	1.2	2.3
Universities				
Sharjah University	681	28.9	27.0	30.8
UAE University	837	35.5	33.6	37.5
Ajman University	837	35.5	33.6	37.5
Year of study				
1st year	175	7.4	6.4	8.5
2nd year	560	23.8	22.1	25.5
3rd year	713	30.3	28.5	32.2
4th year	670	28.5	26.6	30.2
5th year	190	8.1	7.0	9.2
6th year	47	2	1.4	2.6
Employment status				
Yes	165	7	5.9	8.1
No	2190	93	91.9	94.1
Total	2355	100	97.8	102.2

for self-treating their most-recent symptom by only a very small proportion of the users (4.1%; 55 of 1,348); this makes them inappropriate users regardless of the other criteria. The number of users who reported using more than one ONPD for self-treating their most-recent symptom (polypharmacy) was "extremely" low (1.5%; 20 of 1,348). This extremely low rate of polypharmacy users decreases the possibility of drug-drug interactions dramatically (Koh et al., 2005; Rambhade et al., 2012) and also explains, at least in part, the high rate of appropriate ONPD users for the last recent symptoms.

Binary Logistic Regression (BLR) was conducted to

Table 2: Distribution of the assessment criteria among inappropriate users (n=108).

Assessment criteria	Description	Number	Percentage
One inappropriate criterion (n=98) (That is, the least inappropriate user)	Inappropriate drugs	64	59.2
	Inappropriate food-drug administration	18	16.6
	Inappropriate dose	10	9.2
	Inappropriate frequency	6	5.5
Two inappropriate criteria (n=8) (That is, the least inappropriate user)	Inappropriate drug+ inappropriate food drug	3	2.7
	Inappropriate diagnosis + inappropriate drug	2	1.8
	Inappropriate dose+ inappropriate frequency	2	1.8
	Inappropriate dose+ inappropriate food-drug administration	1	0.9
Three inappropriate criteria (n=2) (That is, moderate inappropriate users)	Inappropriate drug +inappropriate dose +inappropriate frequency	2	1.8
Total		108	99.5≈100%

Table 3: Logistic regression model for associations with the least inappropriate ONPD use (n=1348).

Variables	Response	Exp (B)	OR	95% CI		p-value
Polypharmacy behavior (ref-mono)	Poly	0.463	1.589	1.024	2.465	0.039
Safety belief in the use of ONPD (ref-disagree)	Agree	0.532	1.702	1.070	2.709	0.025
	Uncertain	-0.356	0.701	0.701	0.384	0.246
Medication knowledge (ref-good)	Poor	0.651	1.917	0.489	7.511	0.350
	Moderate	-0.498	0.608	0.380	0.972	0.038

assess the association of a number of factors on the likelihood that respondents would be the least inappropriate ONPD. The Hosmer and Leme show goodness of fit test was non-significant (p = 0.401), indicating a good model fit of the data. The statistically significant (p <0.001) Cox and Snell R_2 (0.044) and Nagelkerke R_2 (0.102) suggested that the predictive power of the model is modest. Within this model, three explanatory variables were statistically significant associated factors of inappropriate ONPD use (polypharmacy behavior, safety belief in the use of ONPD, and medication knowledge).

Polypharmacy behavior was a significant predictor variable (OR = 2.457, 95% CI: 1.380-4.373, p=0.002). Therefore, participants who usually took more than one ONPD for self-treating a single symptom per day (polypharmacy behavior) had 1.5 times higher odds of being least inappropriate users than those who usually took only one ONPD a day (mono pharmacy). The odds ratio for participants agreed that ONPD are safe regardless of how frequently they are used with above 1 implying a positive relationship. Therefore, the odds of being least inappropriate ONPD users among participants had this incorrect believe about safety of ONPD are 1.7 times higher than participants who disagreed with the true population effect between 27 and 10%. This result was statistically significant (OR= 1.702, 95% CI: 1.070-2.709, p≤0.05).

Moderate level of medication knowledge was a protective factor against inappropriate ONPD use. The odds of being least inappropriate ONPD user among the response group of moderate medication knowledge are 60% less than in reference group of good medication knowledge with the true population effect between 97 and 38%, respectively. Table 3 shows that this result was statistically significant (p≤0.05).

DISCUSSION

The present study was conducted among the university students in UAE. The majority of the participants were females, which was found common in other studies conducted in UAE (Sharif et al., 2012). This study assessed participants' appropriateness of use based on a five assessment criteria, which verified the accuracy of the drug taken. The most recent symptoms identified were headache, menstrual pain and finally common cold. All these symptoms are common among the general population and display characteristics that are easily identifiable. This may explain the high positive rate

achieved in this assessment. A total of 92% of the participants had five correct assessment criteria, which thus indicated that they had taken the right type of drug for the correct symptom.

Results reported by this study are in contrast with previous literature, which shows that the prevalence of appropriate drug use is much smaller. For example, in Sudan Awad and Eltayeb (2007) reported only 20% appropriate drug use while James et al. (2006) reported a rate of 16%. The significant differences may be explained by methodological approaches as well as, by differences in the sample used. As previously indicated (Kjellsson et al., 2014) bias can interfere with the accuracy of results, especially when a longer period of time has passed between the assessment period and the behavior analyzed. Some of the studies showing different results (Awad and Eltayeb, 2007; James et al., 2008, 2006; Sclafer et al., 1997) used longer recall periods which may have interfered with the results. Another difference between the current study and additional literature exploring the same topic is the sample used. 92% of the participants in this study demonstrated moderate-to-good levels of ONPD knowledge and 86% demonstrated moderate-to-good medication knowledge.

Finally, another justification for the differences in results obtained by other research and the results of the current study may be connected with sample size. A significantly larger number of participants (n=1348) was used in this study by contrast with other research (James et al., 2006) (n = 134) and (James et al., 2008) (n = 141). Large samples are generally more representative of a target population by contrast with smaller samples (Howell, 2011; Tabachnick and Fidell, 2007). Therefore, our research incorporated more possible characteristics of the studied population, thus, avoiding data error through limiting the sample studied to only a small number of individual characteristics.

Participants who engaged in polypharmacy behavior were also more likely to be inappropriate users. Participants who usually took more than one drug concurrently for self-treating a single symptom had a higher probability of being least inappropriate ONPD users than those who usually took only one drug daily. This expected result can be interpreted in several ways, using different drugs means using different active ingredients, which increases the possibility of drug to drug interactions. Furthermore, there is a possibility of using multiple drugs with different brand names but the same active ingredients, which increases the risk of exceeding the maximum recommended dose and also puts these participants at risk of being inappropriate ONPD users (Hughes, 2001; Hardon et al., 2004; Ruiz, 2010).

Previous study (Mamun et al., 2004) with different targeted population also uncovered similar results in relation to polypharmacy and risk of inappropriate ONPD use. Considering that this research is over a decade old, the current study can be regarded as an update on the topic, demonstrating that the association between polypharmacy behavior and inappropriate drug use is consistent through time.

Although 54% of our sample disagreed that ONPDs are safe to use regardless of frequency of use, the other half of the sample did not see ONPDs as dangerous. Because our study also shows significant levels of incautious ONPD use, such results under this variable were to be expected previous cross sectional investigations from UAE. Sharif and Sharif (2014) display similar findings as 20% of the university students (n=200) in UAE, believed that increasing drug dose cannot be dangerous (Sharif and Sharif, 2014).

Another result we expected to find was that low levels of medication knowledge would result in more usage that is inappropriate. However, our finding showed that low-level of medication knowledge was not associated with the use of ONPD but rather the moderate- level. Therefore, having a moderate level of medication knowledge acted as a protective factor against the use of ONPD inappropriately. This finding suggests that students with adequate medication knowledge are using their drugs appropriately. Therefore, our study demonstrates that moderate level of medication knowledge is a power to use ONPD correctly and appropriately. To the best of the author's knowledge, this is the first study to examine the relationship between medication knowledge and inappropriate drug use. However, our findings can be compared with other studies that investigated the associations between self-medication practices, yet, without connecting this with knowledge and appropriate use. These results are however contrasted by the study conducted by Auta et al. (2012) who found no statistically significant connection between the level of knowledge over ONPD and inadequate use. This contrast may be explained by using only the chi-square testing, the limited sample and the demographic characteristics of the participants.

Conclusion

There is high prevalence of ONPD use among university students in UAE. However, the majority of this use was found to be appropriate. To promote healthy ONPD use in university students, awareness campaign is needed in all universities and must stress on the potential dangers of drug addict, drug abuse and polypharmacy behavior. A compulsory course on rational use of medication should be inculcated in the syllabus in all disciplines of university courses. Further studies are required to investigate additional associated factors.

ACKNOWLEDGEMENTS

The researchers would like to thank all participated Universities and their students for cooperation and

participation in this research study.

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