

RESEARCH ARTICLE

Open Access

Risk factors associated with self-medication among women in Iran



Mahmood Karimy¹, Majed Rezaee-Momtaz², Mahmoud Tavousi³, Ali Montazeri³ and Marzieh Araban^{2,4*} 

Abstract

Background: Self-medication is a public health concern that may create several problems such as increase in drug resistance, raise in drug use per capita, and creating side effects. This study was conducted to determine predictors of self-medication based on the theory of planned behavior (TPB) among the Iranian women.

Methods: This was a cross sectional study. A sample of married women completed a validated, anonymous, self-administered questionnaire. The questionnaire included items on demographic variables, knowledge, and TPB structures, and the checklist of women's self-medication practices. The study was conducted in six urban health centers of Shush and Zandieh in Iran during January to July 2016. Data were analyzed using SPSS 23.0 applying t-test and logistic regression.

Results: A total of 360 women took part in the study. The results showed that 76% of women had a history of self-medication and 98.9% stored drugs at home. The most important reasons for self-medication were perceived self-medication harmless (41%), having history of a disease (35.5%), and availability of medications at home (34%). The most frequent diseases for self-medication were fatigue, weakness, and anxiety (24%), and fever (20%). The results obtained from logistic regression analysis indicated that age, place of residence, education level, health insurance status, as well as all constructs of the TPB were significant predictors for self-medication.

Conclusion: The findings indicated that the prevalence of self-medication among Iranian women was high. Since women have important role in shaping the family health, the issue of high prevalence among this population should be considered as a serious problem in Iran. In this regard, it is recommended to consider factors affecting self-medication among women to reduce this health threatening factors.

Keywords: Theory of planned behavior, Self-medication, Women

Background

Self-medication (SM) is a practice in which people use drugs to improve their health that might be different from the help or recommendation of health experts [1]. SM has different forms including taking one or more medications without physicians' prescription, using the previous drug in similar situations, using drugs available at home and not adhering to the physician's recommendation [2–4].

SM is a critical health concern [4] that might cause several problems such as antibiotic-induced drug resistance,

raised drug use per capita, non-desired treatment, and drug toxicity [5]. Studies have shown that SM is accounted for 3% of congenital anomalies. In addition, in some occasions SM could impose extra costs on health care system [4, 6].

SM has been accounted for 67% of the global burden of disease. It has been reported that the rate of SM among Iranian is much more than the global rate [6, 7]. Reports show that 399 drugs per person per year are taken by an Iranians, which is 2 to 4 times higher than the global use [7]. In the United State of America 42% of people take drugs without physician's prescription [8]; this rate is reported to be 91% in Indonesia, [9]; and 57% in Indian women [10]. In Iran, the prevalence of SM is equal to 36 to 83% in different parts of the country [7]. As such it seems that factors effecting SM in different sub-groups of the population are different and of paramount importance. Women are considered to be an appropriate

* Correspondence: arabanm@ajums.ac.ir; araban62@gmail.com

²Department of Health Education and Promotion, Public Health School, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran

⁴Social Determinants of Health Research Center, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran

Full list of author information is available at the end of the article



group for implementing health programs due to being in more contact with family members and with the health care system during pregnancy and the child-growth monitoring period. They also serve as a key role model for their children [6]. However, for some physiological reasons such as dysmenorrhea, premenstrual syndrome, and pregnancy complications they usually consume medication without consulting doctors [5, 11, 12]. Therefore, targeting women for educational interventions in this context might provide better outcomes [5].

Studies showed that a vast majority of people do not have proper knowledge and belief regarding the side effects of SM [7, 13]. SM might lead to the occurrence of adverse drug reaction, Wrong dosages, drug resistance, etc., in addition to, SM could play an important role in health costs rise [14–16]. Given the increasing access to a wide variety of medications in the community and the critical role of individuals in selecting and consuming medications in order to improve their own health, a number of investigators employed theories and models to identify factors that might affect and change people's behaviors [4]. As such Theory of Planned Behavior (TPB) is commonly used to address the issue.

The TPB is a theory that was developed by Icek Ajzen and links beliefs and behaviors [17]. The theory states that attitude toward a behavior, subjective norms, and perceived behavioral control, together shape an individual's behavioral intentions and behaviors. The theory has its root in outcome expectancy [18]. Based on the theory of outcome expectancy people involve in a given behavior when they perceive that a particular behavior can lead to a positive outcome or the effectiveness of the proposed preventive behavior in reducing the vulnerability to negative outcomes is guaranteed. Several studies have shown the applicability of TPB in health education practices [17, 19]. Considering the lack of a theory based study regarding the SM and the fact that SM is a behavioral health problem, the current study was conducted to determine the risk factors associated with self-medication based on the theory of planned behavior.

Method

Design, procedure and the study sample

This was a descriptive study on a sample of married women covered by urban health centers of Shush (a city in south) and Zarandieh (a city in central region), Iran. The Shush has a population of 43534 inhabitants. The population of married women in Shush is estimated at 7968 inhabitants. The Zarandieh has a population of 63907 inhabitants. The population of married women in Zarandieh is estimated at 10721 inhabitants. An expert panel including one epidemiologist, one maternal child specialist, and four health education and promotion

specialists confirmed the selection of the cities. The study was conducted in six urban health centers of Shush and Zarandieh during January to July 2016.

The inclusion criteria were being married, having a child under 6 years old, and lack of any chronic or specific diseases like diabetes, hypertension, and cancer. The exclusion criterion, on the other hand, was rejection to participate in the study. Considering the SM prevalence of 86% in a previous study [7] and the estimate precision of 4% at confidence level of 95%, the number of samples required to participate in the study was considered to be 289. However, in practice 380 people were entered to the study in order to increase the study power. Proportional to the population of two cities, 150 people from Shush (Khoozestan province) and 230 participants from Zarandieh (Markazi Province) were included in the study. Indeed first, the list of health care centers was provided. Four health care centers from Shush and six from Zarandieh were selected through simple random sampling method. Then, based on the number of women attending to the centers, study samples were selected via random sampling from each center. Finally after analyzing the received questionnaires and discarding the incomplete questionnaires, the final analysis was carried out on a total of 360 questionnaires (140 questionnaires from Shush and 220 questionnaires from Zarandieh).

Measures

A self-designed questionnaire was used to collect the data. The questionnaire included 3 parts. The first part included 10 items on demographic variables. The second part consisted of items on the constructs of TPB (including 9 items for measuring knowledge about SM, 7 items for measuring attitude toward SM, 4 items for perceived behavioral control (PBC), and 4 items for subjective norms (SN) and a 10-items checklist for measuring SM over the last 3 months for some common diseases with the probability of self-medication). The third part of the questionnaire examined the reasons for SM with 10 statements. For example, we asked respondents why you used a drug without doctor's prescription and they could choose the statement(s) that best described their reasons such as 'It was available at home or from others' or 'The disease was unimportant'. The content validity of the questionnaire was confirmed by a panel of health education and health promotion specialists and a number of physicians (content validity index = 1, content validity ratio = 1). Face validity was examined by a sample of 20 women and the results was promising (item impact score = 5). The reliability of the questionnaire was assessed by Cronbach's alpha coefficient. A sample of 25 women who were similar to the study population in terms of demographic features completed the

questionnaire and the alpha values were as follows: 0.79 for knowledge, 0.82 for attitude, 0.80 for PBC, and 0.86 for SN.

Scoring

The items of attitude toward the behavior, abstract norms, and perceived behavioral control were designed based on a 7-point Likert scale varying from ‘strongly agree’ (1 point) to ‘strongly disagree’ (7 points). For the knowledge, the correct answer assigned 1 and the incorrect answer as 0. The scoring for the constructs of TPB ranged from 1 to 7 for each item. The items within the checklist (the practice of self-medication) and reasons for SM were set as yes/no format.

Statistical analysis

All data analyses were conducted according to a pre-established analysis plan through SPSS 23 (SPSS, Inc., Chicago, IL, USA). Independent sample t-test was used to compare the mean scores of the constructs of the TPB between two groups (those with and without SM). Logistic regression was performed to determine the association between dependent variables and self-medication. Since the mother’s job, the number of children, age, husband’s age, and education, income were not significant in univariate analysis these were not included in the multiple logistic regressions models. The significance level was set at 0.05 levels. This approach has been reported earlier [20].

Ethics

The Research Ethics Committee of the Saveh and Ahvaz Jundishapur University of Medical Sciences approved the study (Number: IR.SAVEHUMS.REC1396.15, IR.A-JUMS.REC.1398.056.). All participants completed a written informed consent.

Results

In all 380 questionnaires were completed. Of these 20 questionnaires were excluded due to missing data and thus the final analysis was carried out on 360 questionnaires. The mean age of participants was 36.4 ± 6.2 years. Overall, 76% of the sample reported that they had a history of SM, Of these, 69% indicated that husband or a friend encouraged them to take drugs without prescription and almost all women (98.9%) reported that they store drugs at home; 75% had recommended a drug to friends and relatives over the last 3 months, 81% had drug prescription for first degree family members (children/spouse), and 80% believed that SM is the same as self-care. As indicated in Table 1, the most important reasons of SM were: perceived self-medication harmless (41%), having history of a disease (35.5%), and availability of medications at home (34%). In addition the highest frequency of self-medication by a disease was for fatigue, weakness, and anxiety (24%) and the lowest was for

Table 1 The reasons of self-medication from the perspectives of women

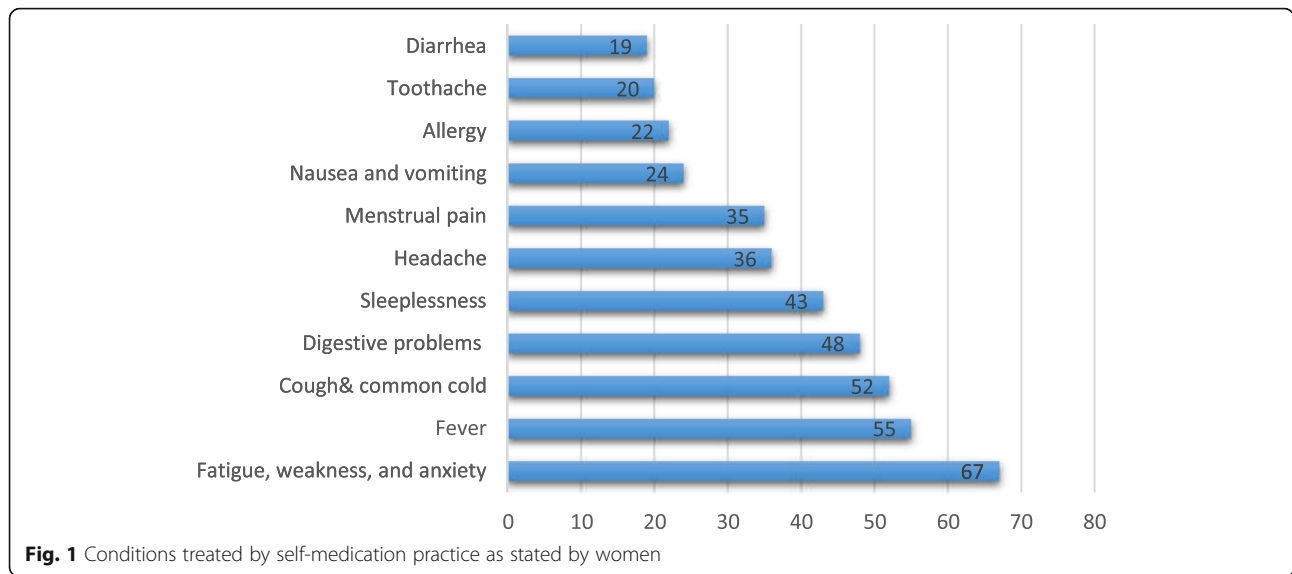
| Reasons for self-medication | Number | (%) |
|--|--------|------|
| Considering medications harmless | 146 | 41 |
| Having history of the disease | 128 | 35.5 |
| Medications availability at home or from others | 122 | 34 |
| Easy and no-prescription delivery of medications from pharmacies | 107 | 30 |
| Considering the disease unimportant | 106 | 29 |
| Insistence of others | 91 | 25 |
| Expensive fees of medical appointments | 50 | 14 |
| Distrust of doctors | 42 | 11.6 |
| Having no access to doctors | 33 | 9 |
| Having not enough time for medical appointments | 30 | 8 |

diarrhea (6.8%). Self-reported conditions treated by self-medication among women are presented in Fig. 1.

In univariate analysis the association between self-medication and the reasons for such practice was not significant but it was significant with knowledge, attitude, PBC, SN, age, place of residence, health insurance, and education level. However, the results obtained from multiple regression analysis indicated that some demographic variables such as age, place of residence, education level, and not having health insurance and all constructs of the TPB were significant predictors for self-medication. Among the TPB constructs the PBC, SN, attitude, and knowledge were the most important predictors (Table 2).

Discussion

The results showed that a high proportion (76%) of the study sample in this study had a history of SM over the last 3 months. Similar findings were reported for women from Uganda [11], India [21], Chile [22] and Italy [23]. However, lower prevalence of self-medication was reported from other regions [24, 25]. For instance, the prevalence of self-medication was 51% in Slovenia [26], 55.3% in Pakistan [27], and 55% in Egypt [28]. SM may lead to problems such as increased per-capita drug use, drug resistance, non-optimal treatment, poisoning, and unwanted side effects [23, 27]. Moreover, SM in women is of more importance, since they experience sensitive periods in their life including pregnancy and lactation. They also serve as the role model for the family members. Hence, it seems necessary to take effective interventions to prevent and reduce SM as an acute health problem in women.



The high prevalence of SM in this study can be attributed to multiple factors. For instance, the easy access to drugs without prescriptions. Such an observation also was reported by similar previous investigations on SM [4, 29]. The study of Motola in Italy [30], Uehleke in Germany [31], and Bonner in the USA [29] also are

consistent with the current work. The low perceived threat could be named as another factor for SM in our study since most people indicated that they use drugs without doctors' prescriptions because they see drugs harmless or they consider the disease unimportant. In line with the present study, in the study by Ahmad et al.

Table 2 Binary logistic regression analysis of reasons associated with self-medication

| Behavioral constructs | Self-medication (n = 276) | Non-self-medication (n = 84) | OR (95% CI) | P |
|---|---------------------------|------------------------------|------------------|-------|
| Variable | | | | |
| Knowledge (mean, SD) | 4.15 ± 1.80 | 7.63 ± 1.57 | 0.57 (0.35–0.94) | 0.03 |
| Attitude (mean, SD) | 21.78 ± 4.25 | 27.41 ± 4.18 | 0.68 (0.51–0.92) | 0.02 |
| Perceived behavioral control (mean, SD) | 9.68 ± 2.37 | 12.04 ± 2.11 | 0.74 (0.60–0.89) | 0.001 |
| Subjective norms (mean, SD) | 11.97 ± 2.01 | 16.21 ± 2.15 | 0.72 (0.58–0.91) | 0.008 |
| Demographical factors | | | | |
| Age | | | | |
| ≤ 19 | 6 (1.6) | 11 (3) | 1.0 (Ref.) | |
| 20–29 | 58 (16.1) | 27 (7.5) | 1.56 (1.18–2.08) | 0.004 |
| 30–39 | 111 (33.3) | 28 (7.7) | 1.94 (1.04–3.79) | 0.041 |
| 40≥ | 101 (25.5) | 18 (5) | 2.21 (1.20–4.20) | 0.01 |
| Place of residence | | | | |
| Urban | 12 (3) | 40 (11) | 1.0 (Ref.) | |
| Rural | 264 (73) | 44 (12) | 1.55 (1.15–2.1) | 0.004 |
| Health insurance | | | | |
| Yes | 250 (69) | 73 (20) | 1.0 (Ref.) | |
| NO | 26 (7) | 5 (1.3) | 1.41 (1.20–1.87) | 0.001 |
| Education level | | | | |
| Higher | 94 (26) | 35 (9.7) | 1.0 (Ref.) | |
| Secondary | 115 (32) | 33 (9) | 1.21 (1.09–1.35) | 0.001 |
| Primary | 62 (17) | 13 (3.6) | 1.25 (1.06–1.27) | 0.003 |
| Illiterate | 5 (1.3) | 3 (0.8) | 1.46 (1.18–1.91) | 0.001 |

in India [32], Zafar et al. in Pakistan [27], and Yu in China [33] the low perceived threat was identified among the major reasons of self-medication. The availability of drugs at home can be referred to as another cause for the high SM in our study, which is in line with previous studies [33–35]. The high prevalence of SM in this study can also be explained by existing social norms in Iran. The results showed that one-fourth of the study sample had SM upon the persistence of others and 69% were encouraged by their husbands/friends for SM. Considering the adverse consequences of taking drugs stored at home by children, healthcare professionals should think about the risk of accidental intoxication among children. As such, providing adequate counseling to mothers about the potential hazards of drugs stored at home is strongly recommended.

Consistent with other studies [4, 18, 19], our results showed that perceived behavioral control had a more important role than the other constructs of the TPB in predicting for SM. It should be noted that the effectiveness of this construct in reducing high-risk behaviors is proven, so health experts must increase the individual's PBC by improving his/her required skills and knowledge. Based on our findings, the attitude was a significant variable in predicting for SM, and that the non-SM scored higher on the attitude compared with the SM group. Here, 41% of the women believed that the drugs they used are harmless and over two-thirds of them considered SM some kind of self-care, which suggests the prevalence of wrong attitudes towards SM. In accord with our findings, in the study by Ocean [11], people with SM had lower scores for attitude. Also, the study of Panagakou [36] indicated that the low attitude was positively related to SM. Overall, it can be stated that it is beneficial to conduct campaigns to change false beliefs through mass media.

Studies on the relationship between knowledge and self-medication showed that wrong and inadequate information is a key contributing factor to high prevalence of SM. Consistent with other works [13, 37], our study showed that the knowledge level of the participants was significant predictor of their SM. In a study by Bajcetic & Jovanovic, parents with lower knowledge had more self-prescription of antibiotics for their children [38]. Elsewhere, Widayati et al. found that knowledge and attitude are the major factors of SM behavior [39].

The results of the present study showed that there was a significant association between age and self-medication where older age was associated with higher probability of SM. This finding is very important considering that from biological perspective liver and kidney are responsible for metabolism of drugs and these organs lose their optimal performance in old age [40] causing an increase in the occurrence of drugs' side-effects (probably due to

the prolonged exposure time) [4]. The prevalence of SM among different age groups is reported in most previous studies [13, 37, 41]. In addition, our results showed that living in rural areas increases the chance of SM as compared to those who were living in urban areas. Perhaps such observation might be attributed to lack of access to physicians and health services in rural areas, which in turn leads to storage of drugs at home and self-medication. It could also be explained that illiteracy or low literacy and consequently low knowledge of the side effects of self-medication are other reasons for increased self-medication by those who are living in rural areas. The higher SM prevalence among those who live in rural areas are reported in previous studies [11, 32]. The literature recommended interventions for enhancing knowledge about the side effects of SM through media such as magazines, radio, and TV to prevent SM among people that live in rural areas.

The results showed that the lack of medical insurance increases the chance of self-medication because people without medical insurance preferred to obtain drugs directly from pharmacies due to the high fees of medical appointments. This result might indicate a need for public insurance for all people in the community. Finally our study demonstrated that the education level is among the important factors affecting SM prevalence: as the education level decreases, the chance of SM increases. As previously evidenced [13, 42], this behavior could be explained by the low health literacy of the low-educated people and consequently their low knowledge of the risks of self-medication. Researchers believe that the role of education in health and health behaviors is more important than that of financial income [18].

Limitation

Self-reported drug use, the possibility of memory bias (SM over the last 3 months) and non-participation of men in the study could be named as the "limitations" of the present study. The current study assessed behavioral determinants on self-medication based on TPB, which might not perfectly describe all factors associated with self-medication.

Conclusion

The findings indicated a high prevalence of SM among Iranian women. Considering the important role of women in the health of family and society, this subject must be considered as a health threat in Iran and must be dealt with properly. In this regard, it is recommended to consider factors affecting SM among women to reduce this health threatening factors.

Abbreviations

PBC: Perceived behavioral control; SM: Self-medication; SN: Subjective norms; TPB: Theory of planned behavior

Acknowledgments

We gratefully acknowledge the women devoted their time to the research. The Authors are grateful to Vice Chancellor for research, Ahvaz Jundishapur University of Medical Science, and Saveh University of Medical Sciences for their assistance with study implementation. Also, the Authors would like to thank Vahid Naseri and Hamid Reza Koohestani for helping us with some parts of data collection and study implementation. Special thanks are extended to respected reviewers for providing us with their valuable and constructive comment.

Authors' contributions

MK and MA were supervisors and principal investigators of the study and drafted the manuscript. AM, MT were advisors of the study. MR collected the data in Shush. All Authors participated in the statistical analysis. All authors contributed to the design and data analysis and assisted in the preparation of the final version of the manuscript. All authors read and approved the final version of the manuscript.

Funding

No financial support was received for this research.

Availability of data and materials

Upon request, we can offer onsite access to external researchers to the data analyzed at Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran. To do so, Dr. Araban should be contacted.

Ethics approval and consent to participate

All participants were informed about the study and confidentiality protocols. Written Informed consent was obtained from all the participants. Data for this research was obtained from two earlier researches which the Ethics Committee of Ahvaz Jundishapur University of Medical Sciences IR.AJUMS.REC.1398.056 and Saveh University of Medical Sciences (IR.SAVEHUMS.REC.1396.15) confirmed the morality and ethics of those study.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests. The corresponding author of this manuscript (MA) is a member of the editorial board (Associate Editor) of this journal.

Author details

¹Social Determinants of Health Research Center, Saveh University of Medical Sciences, Saveh, Iran. ²Department of Health Education and Promotion, Public Health School, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran. ³Health Metrics Research Center, Iranian Institute for Health Sciences Research, ACECR, Tehran, Iran. ⁴Social Determinants of Health Research Center, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran.

Received: 30 May 2018 Accepted: 10 July 2019

Published online: 01 August 2019

References

- Neafsey PJ, Jarrin O, Luciano S, Coffman MJ. Self-medication practices of Spanish-speaking older adults in Hartford, Connecticut. *Hisp Health Care Int*. 2007;5(4):169–79.
- Sarahroodi S, Maleki-Jamshid A, Sawalha AF, Mikaili P, Safaeian L. Pattern of self-medication with analgesics among Iranian University students in Central Iran. *J Fam Community Med*. 2012;19(2):125.
- Kamat VR, Nichter M. Pharmacies, self-medication and pharmaceutical marketing in Bombay, India. *Soc Sci Med*. 1998;47(6):779–94.
- Jalilian F, Hazavehei SMM, Vahidinia AA, Jalilian M, Moghimbeigi A. Prevalence and related factors for choosing self-medication among pharmacies visitors based on health belief model in Hamadan Province, west of Iran. *J Res Health Sci*. 2013;13(1):81–5.
- Askarian M, Maharlouie N. Irrational antibiotic use among secondary school teachers and university faculty members in Shiraz, Iran. *Int J Prev Med*. 2012;3(12):839.
- Foroutan B, Foroutan R. Household storage of medicines and self-medication practices in south-east Islamic Republic of Iran/Conservation de médicaments à domicile et pratiques d'automédication dans le sud-est de la République islamique d'Iran. *East Mediterr Health J*. 2014;20(9):547.
- Azami-Aghdash S, Mohseni M, Etemadi M, Royani S, Moosavi A, Nakhaee M. Prevalence and cause of self-medication in Iran: a systematic review and meta-analysis article. *Iran J Public Health*. 2015;44(12):1580.
- Combest W, Newton M, Combest A, Kosier JH. Effects of herbal supplements on the kidney. *Urol Nurs*. 2005;25(5):381.
- Brata C, Fisher C, Marjadi B, Schneider CR, Clifford RM. Factors influencing the current practice of self-medication consultations in eastern Indonesian community pharmacies: a qualitative study. *BMC Health Serv Res*. 2016;16(1):179.
- Kuriachan KE, George GS, Cherian J, Cheriyan SM, Paul L. A cross-sectional study on the prevalence of self-medication practices and its associated factors among housewives in rural areas of Ernakulam district. *J Evol Med Dent Sci*. 2016;5(46):3009–13.
- Ocan M, Bwanga F, Bbosa GS, Bagenda D, Waako P, Ogwal-Okeng J, Obua C. Patterns and predictors of self-medication in northern Uganda. *PLoS One*. 2014;9(3):e92323.
- Mansouri A, Ahmadvand A, Hadjibabaie M, Kargar M, Javadi M, Gholami K. Types and severity of medication errors in Iran; a review of the current literature. *DARU J Pharm Sci*. 2013;21(1):49.
- Pavydė E, Veikutis V, Mačiulienė A, Mačiulis V, Petrikonis K, Stankevičius E. Public knowledge, beliefs and behavior on antibiotic use and self-medication in Lithuania. *Int J Environ Res Public Health*. 2015;12(6):7002–16.
- Bogner MS. *Human error in medicine*. Boca Raton: CRC Press; 2018. <https://www.taylorfrancis.com/books/9780805813869> DOI: <https://doi.org/10.1201/9780203751725>
- Gumbrevicius G, Milasius A. [Most common cases of the unreasonable medication use]. *Medicina (Kaunas, Lithuania)*. 2003;39(6):610–6.
- Yang P, Chen N, Wang R-R, Li L, Jiang S-PJT. Inappropriateness of medication prescriptions about chronic kidney disease patients without dialysis therapy in a Chinese tertiary teaching hospital. *Ther Clin Risk Manag*. 2016;12:1517.
- Karimy M, Niknami S, Hidarnia AR, Hajizadeh I. Intention to start cigarette smoking among Iranian male adolescents: usefulness of an extended version of the theory of planned behaviour. *Heart Asia*. 2012;4(1):120–4.
- Karimy M, Zareban I, Araban M, Montazeri A. An Extended Theory of Planned Behavior (TPB) Used to Predict Smoking Behavior Among a Sample of Iranian Medical Students. *International journal of high risk behaviors & addiction*. 2015;4(3):e24715.
- Armitage CJ, Armitage CJ, Conner M, Loach J, Willetts D. Different perceptions of control: applying an extended theory of planned behavior to legal and illegal drug use. *Basic Appl Soc Psychol*. 1999;21(4):301–16.
- Zhang Z. Model building strategy for logistic regression: purposeful selection. *Ann Transl Med*. 2016;4(6):111.
- Balamurugan E, Ganesh K. Prevalence and pattern of self medication use in coastal regions of South India. *Br J Med Pract*. 2011;4(3):a428.
- Albarrán KF, Zapata LV. Analysis and quantification of self-medication patterns of customers in community pharmacies in southern Chile. *Pharm World Sci*. 2008;30(6):863–8.
- Garofalo L, Di Giuseppe G, Angelillo IF. Self-medication practices among parents in Italy. *Biomed Res Int*. 2015;2015.
- Fadare JO, Tamuno I. Antibiotic self-medication among university medical undergraduates in northern Nigeria. *J Public Health Epidemiol*. 2011;3(5):217–20.
- Zafar SN, Syed R, Waqar S, Zubairi AJ, Vaqar T, Shaikh M, Yousaf W, Shahid S, Saleem S. Self-medication amongst university students of Karachi: prevalence, knowledge and attitudes. *J Pak Med Assoc*. 2008;58(4):214.
- Smogavec M, Softic N, Kersnik J, Klemenc-Ketiš Z. An overview of self-treatment and self-medication practices among Slovenian citizens. *Zdravniški Vestnik*. 2010;79(11).
- Zafar SN, Syed R, Waqar S, Irani FA, Saleem S. Prescription of medicines by medical students of Karachi, Pakistan: a cross-sectional study. *BMC Public Health*. 2008;8(1):162.
- El Ezz N, Ez-Elarab H. Knowledge, attitude and practice of medical students towards self medication at Ain Shams University, Egypt. *J Prev Med Hyg*. 2011;52(4).
- Bonner S, Zimmerman BJ, Evans D, Irigoyen M, Resnick D, Mellins RB. An individualized intervention to improve asthma management among urban Latino and African-American families. *J Asthma*. 2002;39(2):167–79.

30. Motola G, Russo F, Mazzeo F, Rinaldi B, Capuano A, Rossi F, Filippelli A. Over-the-counter oral nonsteroidal anti-inflammatory drugs: a pharmacoepidemiologic study in southern Italy. *Adv Ther.* 2001;18(5):216–22.
31. Uehleke B, Steinhoff B. Self-medication in Germany. *Int J Clin Pharmacol Ther.* 2001;39(11):484–7.
32. Ahmad A, Patel I, Mohanta G, Balkrishnan R. Evaluation of self medication practices in rural area of town Sahaswan at northern India. *Ann Med Health Sci Res.* 2014;4(8):73–8.
33. Yu M, Zhu Y, Song X, Yang L, Tao T, Zhao Q, Xu B, Zhao G. Insights into citizens' purchasing habits of antibiotics from medicinal sales data of retail pharmacies in rural China. *Fudan Univ J Med Sci.* 2013;40(3):253–8.
34. Al-Azzam S, Al-Husein B, Alzoubi F, Masadeh M, Ali M. Self-medication with antibiotics in Jordanian population. *Int J Occup Med Environ Health.* 2007;20(4):373–80.
35. Sawalha AF. Assessment of self-medication practice among university students in Palestine: therapeutic and toxicity implications. *IUG J Nat Stud.* 2015;15(2).
36. Panagakou SG, Spyridis N, Papaevangelou V, Theodoridou KM, Goutziana GP, Theodoridou MN, Syrogiannopoulos GA, Hadjichristodoulou CS. Antibiotic use for upper respiratory tract infections in children: a cross-sectional survey of knowledge, attitudes, and practices (KAP) of parents in Greece. *BMC Pediatr.* 2011;11(1):60.
37. Awad AI, Aboud EA. Knowledge, attitude and practice towards antibiotic use among the public in Kuwait. *PLoS One.* 2015;10(2):e0117910.
38. Bajčetić M, Jovanović I. Current aspects of rational antibiotic use in paediatrics. *Paediatr Today.* 2012;8(2):79–90.
39. Widayati A, Suryawati S, de Crespigny C, Hiller JE. Self medication with antibiotics in Yogyakarta City Indonesia: a cross sectional population-based survey. *BMC Res Notes.* 2011;4(1):491.
40. Klotz U. Pharmacokinetics and drug metabolism in the elderly. *Drug Metab Rev.* 2009;41(2):67–76.
41. Fernandes M, Leite A, Basto M, Nobre MA, Vieira N, Fernandes R, Nogueira P, Jorge P. Non-adherence to antibiotic therapy in patients visiting community pharmacies. *Int J Clin Pharm.* 2014;36(1):86–91.
42. Lim KK, Teh CC. A cross sectional study of public knowledge and attitude towards antibiotics in Putrajaya, Malaysia. *South Med Rev.* 2012;5(2):26.

Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Ready to submit your research? Choose BMC and benefit from:

- fast, convenient online submission
- thorough peer review by experienced researchers in your field
- rapid publication on acceptance
- support for research data, including large and complex data types
- gold Open Access which fosters wider collaboration and increased citations
- maximum visibility for your research: over 100M website views per year

At BMC, research is always in progress.

Learn more biomedcentral.com/submissions

