



Original article

Top 10 most used drugs in the Kingdom of Saudi Arabia 2010–2015

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ABSTRACT

Medications usage has become a significant part of contemporary life. Many studies indicate that there is an excessive use and a considerable waste of medicines. This descriptive study aims at identifying the most used medicines in Saudi Arabia from 2010 to 2015 according to the statistics of specialized companies in the field. Comparison of the most commonly used drugs with those in the United States aims at clarifying similarities and differences. The results showed that the use of antibiotics and analgesics still accounted for the bulk, followed by proton pump inhibitors and anti-diabetics respectively, then anti-hyperlipidemic agents and erectile dysfunction treatments. The causes of this overuse vary according to the studies concerned between the self-medications and the over-prescription of the medication and the failure of the diagnostic and treatment procedures (malpractice). The recommendations are the strict application of prescribed and non-prescribed dispensing systems and the further establishment and application of national guides in the diagnosis and treatment of communicable diseases. The repetition of such studies is useful in reviewing health policies and regulations related to health practice in general and pharmacological policies in particular.

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1. Background and introduction

The utilization of pharmaceutical medications has become an essential part of our standard of living all round the world. Prescription drugs, particularly, are continuously considered as complicated issue: talk of pharmaceutical company endorsements, the rising cost of drugs and doctors over-prescribing their patients. Needless to say, that these drugs have an enormously affect on the life of the individual and community. For example, the misuse of antibiotics may lead to serious complications that can affect the patient and increase multi-resistant organisms within the community. Even though, Saudi Arabia is considered as a country with a

high usage of OTC (over-the-counter) drugs (Al-rukban et al., 2012), the irresponsible self-medication is common in Saudi Arabia and remains as an essential problem since people did not know whether the medicine they bought is a prescription-only or over the counter medication. Moreover, mean medication wastage was estimated to be 25.8% (Saudi Arabia) and 41.3% (other Gulf countries) which costs a total of –US \$150 million on medications that were never consumed (Abou-Auda, 2003). Meaningful the most utilized drugs amongst the population in Saudi Arabia may open new areas of research. It may also help legislative and executives authorities in Saudi Arabia to improve the policies and regulations regarding the distribution and consuming of pharmaceutical drugs. Reviewing the available literature in Saudi Arabia indicates that this issue has not been previously investigated deeply. The first step in this regard is to determine drug utilization pattern in KSA with actual figures. The main aim of this study is to determine the top ten used drugs in Saudi Arabia. Furthermore, comparing these significant figures to other world leading countries like the USA (United States of America) in regards of most utilized drugs amongst the population will give more realistic

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picture. Finally, recommendations based on the results will be provided.

2. Methods

In this descriptive study, we use Intercontinental Marketing Services (IMS), a health drug database, has been used to determine the top 10 used drugs in the KSA. IMS Health is an American company that provides information, services and technology for the healthcare industry. It is the largest vendor of U.S. physician prescribing data and best known for its collection of healthcare information spanning sales, de-identified prescription data, medical claims, electronic medical records (IMS Institute, 2016) and social media. IMS Health's products and services are used by companies to develop commercialization plans and portfolio strategies, to select patient and physician populations for specific therapies, and to measure the effectiveness of pharmaceutical marketing and sales resources (Steinbrook, 2006). The firm uses its own data to produce syndicated reports such as market forecasts and market intelligence. Focusing on prescribing drugs not OTC is the main objective of this study from the year 2010 till 2015. Additionally, results were compared with the IMS Health drug database of the top 10 used drugs in U.S.A. at the same timeline. Our choice of comparison is the US as it is a leading country in healthcare services and many published papers regarding this subject have been covered in their country, therefore, it is ideal for evaluation (Lindsley, 2012; Kantor et al., 2015). Only data related to Saudi Arabia are mixed with other items which are either non-medical (babys' formulas or food supplements, etc.) or OTC drugs, so data has been filtered to include only drugs that need to be ordered by prescription.

3. Results

It is appeared in Fig. 1 that the top utilized medication class in Saudi Arabia was analgesics specifically diclofenac with different brands from local and international companies. This class represents 67% of the top used drugs in Saudi Arabia. Diclofenac products were amongst top four drugs from 2010 to 2015. In years from 2010 to 2013 the top prescribed medication amongst all types of drugs and analgesics was the original brand of diclofenac. However, the local generic (especially G1) product of diclofenac showed gradual increasing in usage throughout the years which result in leading analgesics class in 2014 and after while the original brand usage dropped heavily in 2015.

The second most used drug class in Saudi Arabia was antibiotics and this class represents 17% of the top used drugs in Saudi Arabia. Amoxicillin plus clavulanic acid complex was the only antibiotic in the top ten list represented by two generic products. The local generic (G1) was the 3rd in the top ten list of the most commonly used antibiotic from 2010 to 2015 with steady increase. There are an antibiotic close to top ten list showed a notable increasing in usage which is ceftriaxone.

The use of two proton pump inhibitors (pantoprazole and esomeprazole) was high in Saudi from 2010 to 2015 and shared the same level of consuming in 2011 and 2014. In 2012 and 2013, pantoprazole was higher in consuming than esomeprazole. However, esomeprazole was the higher in 2015. This class represents around 7% of the most utilized drugs of the most utilized drugs.

A combination of metformin plus sitagliptin became one of the top 10 utilized medications starting from 2012. The utilization of this combination rapidly increased in the following three years where it became the fifth highly utilized agent with 4%.

The two remaining drugs on the list were: tadalafil and atorvastatin respectively with notable increasing, and closely to them sildenafil came with notable increasing. Finally, all these three drugs represent around 5% of the most utilized drugs.

The noteworthy result was that no antibiotics or analgesics were listed on the most utilized drug list of 2010 till 2015 in the United States of America. Fig. 2 illustrates the trend of the top 10 used drugs in USA during the years 2010–2015. Instead of those classes antidiabetics and antiasthmatics share the most of the top 10 used drug list, with utilization reaches almost 40% and 20%, respectively.

4. Discussion

The present study illustrated the utilization pattern of drugs in Saudi Arabia during the years 2010–2015. We are unaware of any previously published study focused on such aspect. Results showed that analgesics represent most utilized drug class in Saudi Arabia, in particular the potent non-steroidal anti-inflammatory drug (NSAID) diclofenac. It is common in the society to use the OTC form of this drug like ointments and jells (Cooper, 2013; Sharma et al., 2015). However, the public use of analgesics can be explained, partially, by self medication (Suleiman, 2013), and the over prescribing of analgesics can be linked to poor control of prescription drugs in community pharmacies in Saudi and the loss of proper national guidelines (Khan, 2014). One of key element in good prescribing practice is conserving the need and objectivity of the patient. In the USA, there were no analgesics in the list of top ten prescribed drugs. Over-utilization of diclofenac is worrisome since this drug has been linked to risk of cardiovascular disease especially when used with high doses and for long duration (Antman et al., 2007). The latter risk prompted worldwide regulatory authorities to request risk minimization measures including contraindication in patient with established congestive heart failure (NYHA II-IV), ischemic heart disease, peripheral arterial disease and/or cerebrovascular disease (Antman et al., 2007; Pawlosky, 2013).

It has been noticed from study results that two antibiotics consistently appeared in the top 10 utilized drugs in Saudi. On the contrary, antibiotics were not found in the top 10 used drugs in USA, although USA had a similar concern before 1995 and it has been solved by controlling the prescription of antibiotics (Roumie et al., 2005). However, irrational use of antibiotics evolved in both developing and developed countries (Morgan et al., 2011). Irrational use of antibiotics has two dimensions, improper prescribing and dispensing. Some doctors prescribe antibiotics to patients based on incorrect diagnosis (for instance, viral upper respiratory tract infections (Stone et al., 2000; Linder and Daniel, 2003)). This can be even complicated by lack of adherence to the prescribed antibiotic therapy by some of patients, increasing risk of antibiotic resistance (Bebell and Muir, 2014). A cross-sectional study investigated selling pattern of antibiotics in community pharmacies in Riyadh, the capital city of Saudi Arabia. The researchers found that more than three quarters of visited pharmacies sold antibiotics to consumers without prescriptions. They also reported that majority of those who dispensed antibiotics without prescription recommend the antibiotics to the patients without direct request from them (Bin Abdulhak et al., 2011). This behavior has been confirmed in another city in Saudi Arabia (Al-Mohamadi et al., 2013). Another study showed that most commonly sold drugs without prescriptions in Riyadh were antibiotics and analgesics (Aljadhey et al., 2015).

Two thirds of all antibiotics are sold without prescription, through unregulated private sectors (Holloway and Van Dijk, 2011). Even in those countries where over-the-counter delivery

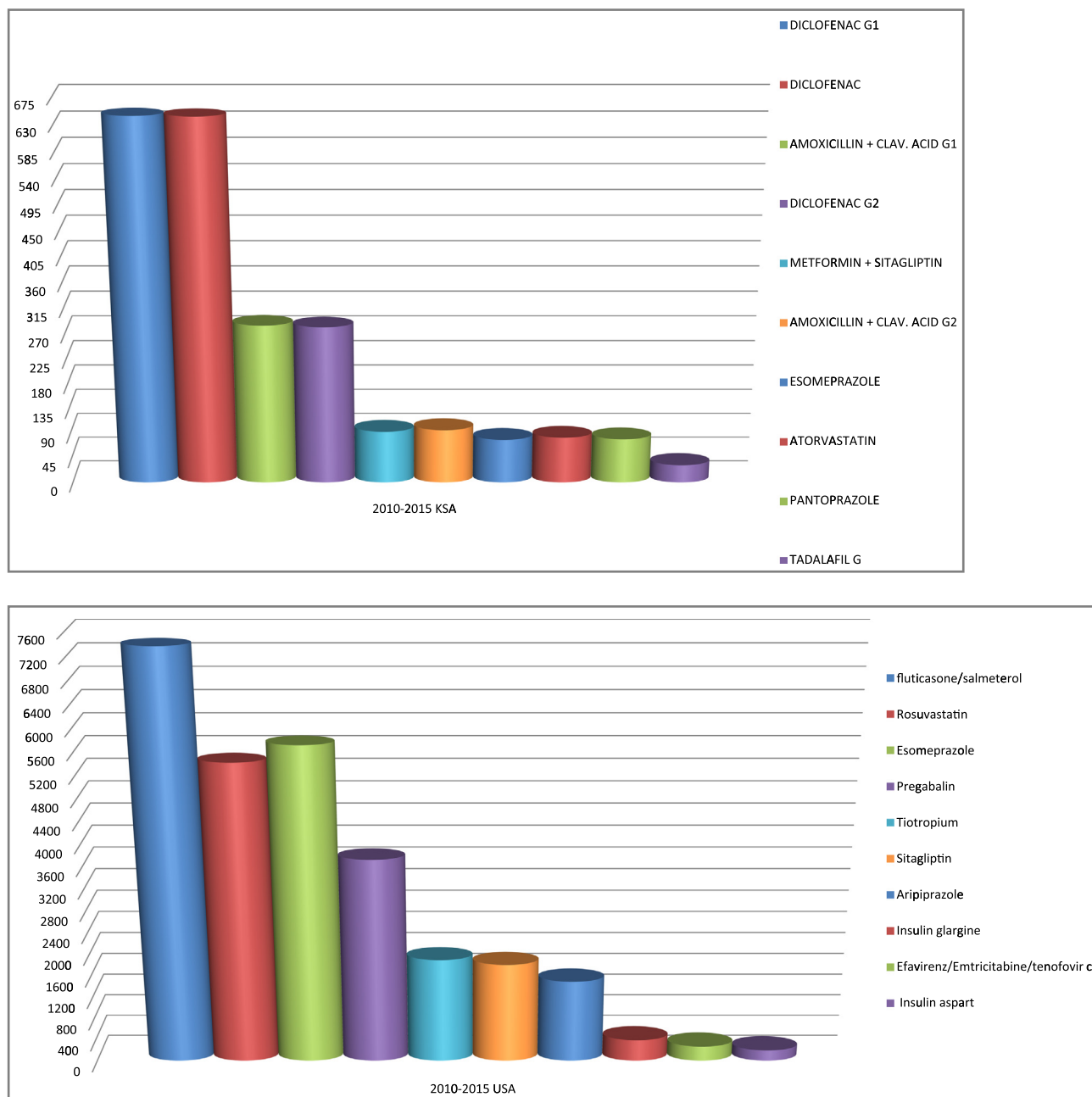


Fig. 1. The trend of the top 10 sold drugs in KSA during the years 2010–2015 (the volume unit is Million).

of antibiotics is not permitted, patients use antibiotics without prescription (Suda et al., 2014). Moreover, Low adherence levels by patients are common; many patients take antibiotics in under-dose or for shortened duration (Ranji et al., 2008).

Low adherence can be referred to many causes, and Table 1 summarized major predictors of poor adherence to medicine (DiMatteo, 2004; Osterberg et al., 2005). Investigators found that irresponsible self-medication is common in Saudi Arabia and most participants had poor knowledge, and negative perceptions regarding self-medication. More than 68% of participants did not know whether the medicine they bought is a prescription-only or over the counter medication (Aljadhey et al., 2015). Generally, antibiotic prescriptions were 24.5% higher in winter months than in the summer in USA (Suda et al., 2014). Similarly, In Saudi Arabia, Practitioners tend to prescribe antibiotics frequently in winter and people tend to use antibiotics during this season and their attitude

toward common cold management related to their level of education (AlKhamees et al., 2017).

Proton pump inhibitors (PPIs) which used as acid-related disorder agents represent 7% of the top ten list coming as the third of all drugs classes in the list. However that does not reflect the proper utilization of this class of medications. Mayet observed that improper use of antisecretory drugs (ASDs) in a tertiary care teaching hospital was 43% (including PPIs) and more prescribed by non-gastroenterologists (Mayet, 2007). This improper prescribing pattern of PPIs, particularly by non-gastroenterologist, was observed earlier in another tertiary teaching hospital (Alzahrani et al., 2016). Such studies indicating that Saudi Arabia, like other countries, suffers from widespread misuse of PPIs in hospital practice (Jones et al., 2001). Collaboration between pharmacists and physicians to Implant correct measures of prescribing and develop

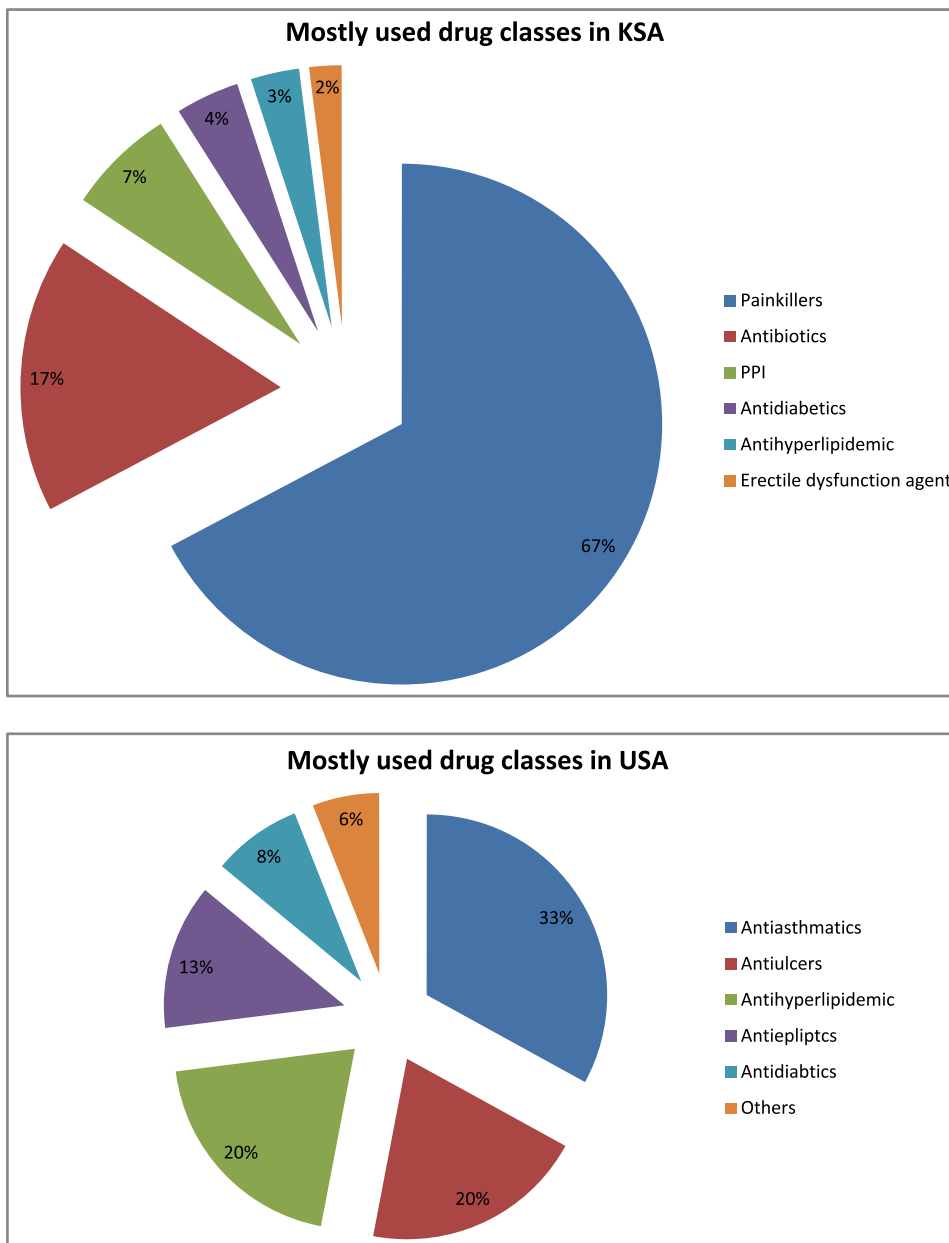


Fig. 2. The pattern of the top 10 prescribed drugs in USA during the years 2010–2015 (the volume unit is Million).

evidence-based practice guidelines and adherence to it will produce improvement in this regard.

Table 1
Major predictors of poor adherence to medicines.

Patient-related limitations	Barriers to care or medicine
Psychological problems, particularly depression	Poor relationship between patient and provider
Cognitive impairment	Missed appointments
Asymptomatic disease	Lack of health insurance
Inadequate follow-up or discharge planning	Cost of copayment or coinsurance
Side effects of medicine	Complexity of treatment
Patient lacks belief in benefit of treatment	Access restrictions (e.g., formularies, utilization management)
Patient lacks insight into the illness	

Adapted from (Osterberg et al., 2005).
“Adherence to Medicine,” *New England Journal of Medicine*, August 2005.

The other drug classes in the list such as antidiabetics and anti-hyperlipidemic may reflect the current situation of chronic disease in Saudi Arabia (Alqurashi et al., 2011; Al-Daghri et al., 2011). These figures are similar to that seen in the USA if the population and the deference’s in type of diseases status and types are considered. For instance, the presence of diabetes treatment for type 1 and type 2 in USA list of the top ten utilized drugs should be noticed. The increase in the prescribing of drugs used to chronic disease is expected due to the increase in the prevalence of disease treated by these agents. On the other hand, the effect of insurance coverage in type and number of medication should be considered. Studies, in Saudi Arabia, showed that physicians in private sector are more likely to prescribe more drugs and/or brand drugs to insured patients than for uninsured patients (Neyaz et al., 2011; Al-Mohamadi et al., 2014). The influence of insurance coverage in prescribing behavior is a common problem in other countries. It

has been noticed in USA (Poisal and Murray, 2001), Sweden (Lundin, 2000) and Greece (Theodorou et al., 2009).

Starting from 2011, there was an interesting increase in the utilization of erectile dysfunction agents. Two reasons can explain such results; the high prevalence of type 2 diabetes mellitus in Saudi and self-medication. It has been estimated that almost one-quarter of Saudi Population suffer from type 2 diabetes mellitus (Al-Daghri et al., 2011). The latter is a well-established risk factor for macro- and microvascular complications including sexual dysfunction (Maiorino et al., 2014). Over the counter selling of erectile dysfunction is common in community pharmacies. Recent study investigated the use of phosphodiesterase 5 inhibitors (PDEIs) in a sample of 1008 Saudi men and reported that vast majority of PDEIs users bought them without prescription (Alshahrani et al., 2016).

Finally, the list of top ten for Saudi Arabia reflects the notable using of local generic drugs beside the original drugs indicating probably good awareness of prescribers about the comparable effectiveness of generic and original drugs (Ahire et al., 2013; Dunee et al., 2013).

Our study has some limitations. Consumption data derived from the IMS database do not revealed the full picture of medications utilizations in Saudi Arabia since it only covers 5 years only and the presence of online pharmacy.

5. Conclusion

Results showed that analgesics were the highest class of drugs used in Saudi Arabia followed by antibiotics as the second largest group with 2 antibiotics in the list of top ten throughout the years the study was conducted. Activation of an electronic tracking system will help observing that inappropriate medications prescription and dispensing by health professionals which can be a major factor in the over and misuse of those medications. This paper shows alarming increase in utilization of antibiotics and hence regulatory actions are needed to combat antibiotics misuse for better impact on the society. National guidelines for the management of common diseases are essential to minimize unnecessary over utilization of certain medications in health facilities. Future studies should focus on improving the consumers' awareness of self-medication, the proper use of medications and the way to avoid low adherence. Finally more prescribing patterns within each specialty will help in that regard. Hopefully, this study will initiate a platform for further research on the use of pharmaceutical drugs and prescribing patterns in Saudi Arabia. In addition it may help directly the public awareness.

References

Abou-Auda, Hisham S., 2003. An economic assessment of the extent of medication use and wastage among families in Saudi Arabia and Arabian Gulf Countries. *Clin. Ther.* [https://doi.org/10.1016/S0149-2918\(03\)80083-8](https://doi.org/10.1016/S0149-2918(03)80083-8).

Ahire, K., Manish, S., Mahesh, G., Vinay, S., Meera, S., 2013. A survey based study in current scenario of generic and branded medicines. *Int. J. Pharm. Pharm. Sci.* 5 (3), 705–711.

Al-Daghri, N.M., Al-Attas, O.S., Alokail, M.S., Alkharfy, K.M., Mansour, Y., Shaun, L.S., George, P.C., 2011. Diabetes mellitus type 2 and other chronic non-communicable diseases in the central region, Saudi Arabia (Riyadh Cohort 2): a decade of an epidemic. *BMC Med.* 9 (1), 76. <https://doi.org/10.1186/1741-7015-9-76>.

Aljadhey, H., Assiri, G.A., Mahmoud, M.A., Al-Aqeel, S., Murray, M., 2015. Self-medication in central Saudi Arabia: community pharmacy consumers' perspectives. *Saudi Med. J.* 36 (3), 328–334. <https://doi.org/10.15537/smj.2015.3.10523>.

AlKhamees, O., AlNamlah, S., Abohaimed, A., AlSubiaie, N., AlSanad, S., 2017. Public behavior towards common colds: a cross section study (Un published data).

Al-Mohamadi, A., Badr, A., Bin, Mahfouz L., Samargandi, D., Al Ahdal, A., 2013. Dispensing medications without prescription at Saudi community pharmacy:

extent and perception. *Saudi Pharm. J.* 21 (1), 13–18. <https://doi.org/10.1016/j.jsps.2011.11.003>.

Al-Mohamadi, A., Al-Harbi, A.M., Manshi, A.M., Rakkah, M.M., 2014. Medications prescribing pattern toward insured patients. *Saudi Pharm. J.* 22 (1), 27–31. <https://doi.org/10.1016/j.jsps.2013.01.002>.

Alqurashi, K.A., Aljabri, K.S., Bokhari, S.A., 2011. Prevalence of diabetes mellitus in a Saudi community. *Ann. Saudi Med.* 31 (1), 19–23. <https://doi.org/10.4103/0256-4947.75773>.

Al-Rukban, M.O., Khalil, M.A., 2012. Adherence to OTC directory – the perception of community pharmacists in Saudi Arabia. *J. Ayub Med. Coll. Abbottabad*, 24, 3–4. <<http://www.ayubmed.edu.pk/JAMC/24-3/Othman.pdf>>.

Alshahrani, S., Ahmed, A., Gabr, A.H., Al Ansari, A., El-Feky, M., Elbadry, M.S., 2016. Phosphodiesterase type 5 inhibitors: irrational use in Saudi Arabia. *Arab J. Urol.* 14 (2), 94–100. <https://doi.org/10.1016/j.aju.2016.03.003>.

Alzahrani, M.A., Ghamdi, B.A., Al ahmari, A.S., Alqahtani, E.A., Saleh, A.C., Ahmed, M. E.K., 2016. The prescribing pattern of proton pump inhibitors by non-gastroenterologists in a tertiary teaching hospital in the Kingdom of Saudi Arabia. *JAAAP* 1, 341–345.

Antman, E.M., Bennett, J.S., Daugherty, A., Furberg, C., Roberts, H., Taubert, K.A., 2007. Use of nonsteroidal antiinflammatory drugs: an update for clinicians a scientific statement from the American Heart Association. *Circulation* 115, 1634–1642. <https://doi.org/10.1161/CIRCULATIONAHA.106.181424>.

Bebell, Lm, Muir, A., 2014. Antibiotic use and emerging resistance—how can resource-limited countries turn the tide? *Glob Heart* 9 (3), 347–358. <https://doi.org/10.1016/j.gheart.2014.08.009>.

Bin Abdulhak, A.A., Al Tannir, M.A., Almansor, M.A., Almohaya, M.S., Onazi, A.S., Marei, M.A., Aldossary, O.F., et al., 2011. Non prescribed sale of antibiotics in Riyadh, Saudi Arabia: a cross sectional study. *BMC Public Health* 11, 538–542. <https://doi.org/10.1186/1471-2458-11-538>.

Cooper, R.J., 2013. Over-the-counter medicine abuse – a review of the literature. *J. Substance Use* 18 (2), 82–107. <https://doi.org/10.3109/14659891.2011.615002>.

Dimatteo, M.R., 2004. Variations in patients' adherence to medical recommendations. *Med. Care* 42, 200–209. <https://doi.org/10.1097/01.mlr.0000114908.90348.f9>.

Dunee, S., Shannon, B., Dunne, C., Cullen, W., 2013. Generics – equal or not? *Aust. Prescriber* 14 (1), 1–24. <https://doi.org/10.18773/austprescr.2003.063>.

Holloway, K., Van Dijk, L., 2011. The world medicines situation 2011 rational use of medicines, Geneva, 2011.

IMS Institute for Healthcare Informatics, 2016. Medicines Use and Spending in the U.S. Medicines Use and Spending in the US: A Review of 2015 and Outlook to 2020.

Jones, M.I., Greenfield, S.M., Jowett, S., Bradley, C.P., Seal, R., 2001. Proton pump inhibitors: a study of GPs' prescribing. *Fam. Pract.* 18 (3), 333–338 <<http://www.ncbi.nlm.nih.gov/pubmed/11356744>>.

Kantor, E.D., Rehm, C.D., Haas, J.S., Chan, A.T., Giovannucci, E.L., 2015. Trends in prescription drug use among adults in the United States from 1999–2012. *JAMA* 314 (17), 1818–1831. <https://doi.org/10.1001/jama.2015.13766>.

Khan, T.M., 2014. The consequences of nonprescription medication sales in Saudi Arabia's community pharmacies: regulations without implementation. *Ther. Adv. Drug Saf.* 5 (4), 173–174. <https://doi.org/10.1016/j.jsps.2013.07.005>.

Linder, J.A., Daniel, E.S., 2003. Desire for antibiotics and antibiotic prescribing for adults with upper respiratory tract infections. *J. Gen. Intern. Med.* 18, 795–801.

Lindsley, C.W., 2012. The top prescription drugs of 2011 in the United States antipsychotics and antidepressants once again lead CNS therapeutics. *ACS Chem. Neurosci.* 3, 630–631.

Lundin, D., 2000. Moral hazard in physician prescription behavior. *J. Health Econ.* 19 (5), 639–662 <<http://www.ncbi.nlm.nih.gov/pubmed/11184797>>.

Maiorino, M.I., Bellastella, G., Esposito, K., 2014. Diabetes and sexual dysfunction: current perspectives. *Diabetes Metab. Syndrome Obesity: Targets Ther.* 7, 95–105. <https://doi.org/10.2147/DMSO.S36455>.

Mayet, A.Y., 2007. Improper use of antiseptics drugs in a tertiary care teaching hospital: an observational study. *Saudi J. Gastroenterol.* 13 (3), 124–128.

Morgan, D.J., Okeke, I.N., Laxminarayan, R., Perencevich, E.N., Weisenberg, S., 2011. Non-prescription antimicrobial use worldwide: a systematic review. *Lancet. Infect. Dis.* 11, 70054–70058. <https://doi.org/10.1016/S1473-3099>.

Neyaz, Y., Qureshi, N.A., Khoja, T., Magzoub, M.A., Haycox, A., and Walley, T., 2011. Physicians medication prescribing in primary care in Riyadh City, Saudi Arabia. Literature review, Part 1: variations in drug prescribing. *Eastern Mediterranean Health J.* = La Revue de Sante de La Mediterranee Orientale = Al-Majallah Al-Sihhiyah Li-Sharq Al-Mutawassit 17(2), 126–131. <<http://www.ncbi.nlm.nih.gov/pubmed/21735947>>.

Osterberg, L., Blaschke, T., Koop, C.E., 2005. Adherence to medication. *N. Engl. J. Med.* 353, 487–497.

Pawlosky, N., 2013. Cardiovascular risk: are all NSAIDs alike? *Can. Pharm. J.: CPJ = Revue Des Pharmaciens Du Canada: RPC* 146 (2), 80–83. <https://doi.org/10.1177/1715163513481569> (SAGE Publications).

Poisaal, J.A., Murray, L., 2001. Growing differences between medicare beneficiaries with and without drug coverage. *Health Aff.* 20 (2), 74–85. <https://doi.org/10.1377/hlthaff.20.2.74>.

Ranjit, S.R., Steinman, M.A., Shojania, K.G., Gonzales, R., 2008. Interventions to reduce unnecessary antibiotic prescribing. *Med. Care* 46 (8), 847–862. <https://doi.org/10.1097/MLR.0b013e318178eabd>.

Roumie, C.L., Halasa, N.B., Grijalva, C.G., Edwards, R.M., Zhu, Y., Dittus, R.S., Griffin, M.R., 2005. Trends in antibiotic prescribing for adults in the United States—1995 to 2002. *J. Gen. Intern. Med.* 20 (8), 697–702. <https://doi.org/10.1111/j.1525-1497.2005.0148.x> (Springer).

- Sharma, L., Bhasker, S., Bhasker, S., 2015. Over the counter medications-an account. *Adv. Biomed. Pharma* 2 (4), 181–189.
- Steinbrook, R., 2006. For sale: physicians' prescribing data. *N. Engl. J. Med.* 354 (26), 2745–2747. <https://doi.org/10.1056/NEJMp068125> (Massachusetts Medical Society).
- Stone, S., Gonzales, R., Maselli, J., Lowenstein, S.R., 2000. Full-text antibiotic prescribing for patients with colds, upper respiratory tract infections, and bronchitis: a national study of hospital-based emergency departments. *Ann. Emerg. Med.* 36 (4), 320–327.
- Suda, K.J., Hicks, L.A., Roberts, R.M., Hunkler, R.J., Taylor, T.H., 2014. Trends and seasonal variation in outpatient antibiotic prescription rates in the United States, 2006 to 2010. *Antimicrob. Agents Chemother.* 58 (5), 2763–2766. <https://doi.org/10.1128/AAC.02239-13>.
- Suleiman, A.K., 2013. Self-medication and the Advisory Role of Pharmacists in Riyadh, Saudi Arabia. *Arch. Pharm. Pract.* 4 (4), 180–185.
- Theodorou, M., Tsiantou, V., Pavlakis, A., Maniadas, N., Fragoulakis, V., Pavi, E., Kyriopoulos, J., 2009. Factors influencing prescribing behaviour of physicians in Greece and Cyprus: results from a questionnaire based survey. *BMC Health Serv. Res.* 9 (1), 150. <https://doi.org/10.1186/1472-6963-9-150>.