E-ISSN: 2320-1215
P-ISSN: 2322-0112

Research and Reviews: Journal of Pharmacy and Pharmaceutical Sciences

A Review on the Quality Control Analysis of Oral Dosage Form: Tablets

Shabana. Md*
Andhra University College of Pharmaceutical Sciences, Andhra University, Visakhapatnam, Andhra Pradesh, India

Review Article

Received: 08-06-2016
Accepted: 24-06-2016
Published: 28-06-2016

***Corresponding author:** Shabana. Md, Andhra University College of Pharmaceutical Sciences, Andhra University, Visakhapatnam, Andhra Pradesh, India.

E-mail: md.shabanab@gmail.com

Keywords: Tablets, Dosage form, Capsules, Quality Control, Disintegration, Tablet evaluation, Excipients, Dissolution, Pharmacopoeia, Active Pharmaceutical ingredient API, Disintegration.

ABSTRACT

The most popular of the oral dosage forms are the tablets which are easily administered by patients and many people rely on these. The pharmacists prescribe the right drug to be administered to patients; this is based on the quality, brand, and product availability in the market. The quality tests are so performed to meet the criteria in advance. Quality control Analysis is to regularly check in each step to produce a good quality of the products. There are many dosage forms available in the markets in many brands. In this review article tablet evaluation techniques and methods have been explained which are applicable to all the dosage forms production.

INTRODUCTION

Tablets and capsules are the dosage forms that are manufactured for pharmaceutical and dietary supplements which are under regulated terms and laws. Regulations are imposed in the manufacturing process to ensure the quality, efficacy and safety of the tablets and capsules. To test these qualities the products undergo many quality tests to meet the regulations and standards in the market [1-20].

The testing procedures induce physical, chemical and biological tests for both the tablets and capsules. These are done with the standard quality control procedures under the pharmacopoeia of the respective countries. Many nations follow the British Pharmacopoeia to meet the required regulated standards in the world market. Manufacturing, production, packaging, Testing are the main phases of pharmaceutical products in every industry.

TABLETS

The most common form of the oral route administration which comes on mind are the tablets which have the most substantial and significant place among the entire pharmaceutical formulations. The oral dosage forms have more importance in the pharmaceutical markets. They are manufactures in large scale and small scale units of pharmaceutical production. Tablets size, shape and thickness are more important in the packaging process while the organoleptic properties include the colour and odor of the tablets [21-31].

Different pharmacopoeia quality control tests of tablets:

According to the British Pharmacopoeia, Tablets are tested for 1 Active Ingredients Content; 2 Disintegration; 3 Uniformity of Content; 4 Labeling.

Tablets are of different types based upon the API. The different types are:

- Uncoated Tablets
- Effervescent tablets
- Coated tablets
- Gastro Resistant Tablet
- Modified Release Tablet
- Dispersible Tablet

- Enteric Coated tablet
- Soluble Tablet
- Controlled release tablets
- Sustained release tablets

The quality control tests of these tablets depend on the nature of the tablet. The quality control tests remove the damaged or broken tablets or which are unblinded to the ingredient.

Quality Control test for Tablets

Disintegration Test: This is the official test which testifies the time required for a tablet to disintegrate in the solution. The time required to break the tablet into fine particles. Disintegration test helps in knowing the API solubility in the gastric fluids of the digestive system. This test is ideal for all tablets but is not performed for controlled and sustained release tablets. Temperatures are maintained accordingly for each tablet. It is calculated by the time required to dissolve the tablet in the liquid and compared with the standard time in the pharmacopoeia [41-50].

Hardness: It is the load required to crush the tablet when placed on its edge. The test is performed to meet the need for pressure adjustments on the tableting machine. Hardness affects the disintegration test. If the tablet is too hard, it may not disintegrate in the required period of time. And if the tablet is too soft, it will not withstand the handling during subsequent processing such as coating or packaging. If the tablet hardness is too high, we first check its disintegration before rejecting the batch. If the disintegration is within limit, we accept the batch.

General Appearance: The general appearance of a tablet, its identity and general elegance is essential for consumer acceptance, for control of lot-to-lot uniformity and tablet-to-tablet uniformity. The control of general appearance involves the measurement of size, shape, color, presence or absence of odor, taste etc. Size and shape may vary from tablet to tablet [51-70].

Unique Identification marking: These are used in the form of embossing, engraving or printing. These can include the company identification marks, or any other symbols related to the dosage form.

Friability: The Roche Friabillator is used to check the friability of the tablets. Initial weight of the tablets is checked before placing them in the device and batches are separated to check accordingly. Initial and final weight of the tablet is checked. Compress tablet that lose less than 0.5 to 1.0 % of the Tablet weigh are consider acceptable. Friability is a often related to hardness testing [71-90].

Thickness test: Thickness test is performed for very few tablets as it is not a official test to perform. Thickness of tablet is measured by Vernier caliper/screw gauge.

Weight Variation test: It is performed to check the uniformity of the tablet.

Dissolution test: Dissolution is an official test. Dissolution is performed to check the percentage release from the dosage forms.

Before the tablets are processed they undergo evaluation tests which determine the right granule testing procedure to compress the tablets.
Granules are the API formulations which are compressed to form the tablets. Granules are prepared by combining the API, excipients and binders. This dough is used to prepare granules which are dried and then undergo evaluation test.
1. Particle Size and Shape determination: The size and shape depends upon the processing requirements and during granulation. The methods for determining the shape are: Sieving, Sedimentation rate, Microscopy, Light screening.
2. Surface area of granules: This is generally used for drug substances but not for the granules.
3. Density: Density is the compressibility, porosity and dissolution of tablet. Methods for density are: Granular density- It is calculated by using the equation Figure 1.

Density D=M/Vp –Vi
Vp- total Pressure; Vi- Volume of intrusion

E-ISSN: 2320-1215
P-ISSN: 2322-0112

Figure 1: Bulk density apparatus.

Granular strength and friability: To determine the changes in the particle size distribution of granulations and compressibility.

Flow properties: This is to determine the granule flow from hopper to die cavity for tablet uniformity for tablet uniformity. Flow properties of granules are determined by three parameters:
Angle of repose: Static angle of repose and Dynamic angle of repose.
$\tan \theta = h/r$
Hausner's ratio: To predict the powder flow property.
Hausner's ratio= tapped density/ bulk density

Moisture Content: It is the amount of moisture present in the granules.
%moisture content = initial wt–final wt/Initial weightx100

DISCUSSION

- The tablets are evaluated based on the biological types, API and nature of tablet.
- Uncoated Tablets include Aspirin 400 mg, Paracetamol 500 mg, Acetazolamide 250 mg, Cetirizine B.P 10 mg, Atenolol and Amlodipine I.P. 50 mg etc.
- Effervescent tablets include Ranitidine, Co-codamol, Sodium dichloroisocynuarate, Ascorbic acid etc.
- Coated tablets include enteric coated Aspirin, Enteric coated Diclofenac etc.
- There are many tablets in the pharmaceutical market which are determined with various brand names and are formulated with the standard procedure and API content [91-100].

CONCLUSION

The quality control testing is assigned to production or quality control depending on the company basis of large scale and small scale. The Quality executives evaluate the quality tests of the tablets to pass the products into markets. These are regularly checked by the RA and FDA bodies. The Quality tests are performed as discussed above, these tests brings out the errors, and misbranded and bad quality products. The standard of the products are based upon this analysis and results of the tests which achieve therapeutic and quality goals. It is the duty of the of the pharmaceutical companies to manufacture the dosage forms which can sustain rattling and handling to have more shelf life and demand in the pharmaceutical markets.

REFERENCES

1. Biswas D and Halquist M. Using Biorelevant in Vitro Models Testing to Characterize Release of Non Oral Dosage Forms as another Tool for Safety. J Pharmacovigil. 2016;4:e153.
2. Bhattacharjee J. Mass Drugs Administration in India - A Failure Story. Epidemiology (Sunnyvale). 2016;6:252.
3. Swain S and Beg S. Emergence in the Lipid-Based Nanostructured Systems for Optimizing Oral Delivery of Drugs. Pharmaceut Reg Affairs. 2016;5:e157.
4. Maia Campos PMBG et al. An Oral Supplementation Based on Hydrolyzed Collagen and Vitamins Improves Skin Elasticity and Dermis Echogenicity: A Clinical Placebo-Controlled Study. Clin Pharmacol Biopharm. 2015;4:142.

5. Gelaw BK, et al. Prescription Pattern of Injection at Out Patient Pharmacy Department of Adama Hospital Medical College, Adama, Ethiopia. Clin Pharmacol Biopharm. 2015;4:146.
6. Kokardekar RR, et al. Development and Evaluation of Sustained Release Microspheres of Glibenclamide by Emulsion Solvent Evaporation Method. Clin Pharmacol Biopharm. 2014;3:127.
7. Cho SK. The Synergistic Effects of Pioglitazone on the Glucose-Lowering Action of Metformin in Relation to OCT1 and Gluts m-RNA Expression in Healthy Volunteer. Clin Pharmacol Biopharm. 2015;3:129.
8. Ehrenpreis ED, et al. A Survey of Lawsuits Filed for the Complaint of Tardive Dyskinesia Following Treatment with Metoclopramide. Clin Pharmacol Biopharm. 2015;4:131.
9. Adnan M, et al. Evaluation of Self-Medication Practices and Awareness among Students in Al Qassim Region of Saudi Arabia. Clin Pharmacol Biopharm. 2015;4:133.
10. Reure J, et al. Her2 Positive Metastatic Breast Cancer Patient without Any Sign of Recurrence 5 years after Cessation of Trastuzumab: A Case Report Clin Pharmacol Biopharm. 2015;4:136.
11. Gavasane AJ and Pawar HA. Synthetic Biodegradable Polymers Used in Controlled Drug Delivery System: An Overview. Clin Pharmacol Biopharm. 2014;3:121.
12. Aghahowa SE, et al. Tolerabilities of Artemisinin-Based Combination Drugs among Patients with Uncomplicated Malaria in a Tertiary Institution Benin City, Nigeria. Clin Pharmacol Biopharm. 2014;3:123.
13. De Wolf J, et al. Evolution of Drug Utilization in Nursing Homes in Belgium. Clin Pharmacol Biopharm. 2014;3:124.
14. González EM, et al. In Vitro Antioxidant Capacity of Crude Extracts and Acetogenin Fraction of Soursop Fruit Pulp. Pharm Anal Acta. 2016;7:484.
15. Permender R, et al. Novel Statistically Designed Qbd Methodology for Quantitative Analysis of Nisoldipine in Pharmaceutical Dosage Forms. Pharm Anal Acta. 2016;7:489.
16. Abass SAE, et al. Development and Validation of Spectrophotometric and Pre-column Derivatization HPLC Method for Determination of Famotidine in Pharmaceuticals by Reaction with Sodium Nitroprusside; Application to Combined Tablets. Pharm Anal Acta. 2016;7:476.
17. Ranjna C, et al. Pharmaceutical Analysis and the Growing Disciplines. Pharm Anal Acta. 2016;7:478.
18. Sohel D, et al. Bioavailability Study of Sustain Release Preparations of Three Widely used NSAIDS Available in Bangladesh. Pharm Anal Acta. 2016;7:482.
19. Lee S, et al. Lifetime Assessment of POCT Strips through Accelerated Degradation Test. Pharm Anal Acta. 2016;7:475.
20. Kogawa AC, et al. Quantification of Doxycycline in Raw Material by an Eco-Friendly Method of Infrared Spectroscopy. Pharm Anal Acta. 2016;7:463.
21. Shimodaira S, et al. Quality Verification of Dendritic Cell-Based Cancer Vaccine. Pharm Anal Acta. 2016;7:465.
22. Hassali MA, et al. Role of Pharmacists in Health Based Non-Governmental Organizations NGO: Prospects and Future Directions. Pharm Anal Acta. 2016;7:467.
23. Vergeire-Dalmacion G. Usefulness of Cost Effectiveness: Evidence versus Applicability. Pharm Anal Acta 2016;7:456.
24. Wang C. Application of In Vitro Models in Developmental Neurotoxicity and Pharmaceutics Research. J Mol Pharm Org Process Res. 2015;3:e122.
25. Lyubchenko YL. Nanoimaging for Molecular Pharmaceutics of Alzheimer's and other Neurodegenerative Disorders. J Mol Pharm Org Process Res. 2013;1:e107.
26. Skalko-Basnet N. Note on the "Molecular Pharmaceutics and Organic Process". J Mol Pharm Org Process Res. 2013;1:e104.
27. Foldvari M. Nanopharmaceutics Innovations in Gene Therapy: Moving Towards Non-Viral and Non-Invasive Delivery Methods. J Nanomedine Biotherapeutic Discov. 2014;4:e135.
28. Qumbar M, et al. DOEBased Stability Indicating RP-HPLC Method for Determination of Lacidipine in Niosomal Gel in Rat: Pharmacokinetic Determination. Pharm Anal Acta. 2014;5:314.
29. Abbas-Aksil T, et al. Matrix Tablets from Algerian Lyophilized Berries LB Arbutus unedo L. Date Phoenix dactylifera L.0020Nat Prod Chem Res. 2016;4:207.
30. Oshizumi Y et al. Dynamics of Swallowing Tablets during the Recovery Period following Surgery for Tongue Cancer. Otolaryngology. 2016;6:218.

31. Kubo Y, et al. Interventional Evaluation of Monoammonium Glycyrrhizinate-Glycine/DLMethionine Combination Tablets in Mild Alopecia Areata. J Clin Exp Dermatol. 2016;Res7:322.
32. Belafkih B, et al. LCMS/ MS Analysis of MDMA in Ecstasy Tablets in Morocco. J Forensic Res. 2015;6:301.
33. Vargas M, et al. Bioequivalence Study of Two Formulations Containing Rosuvastatin 40 Mg Tablets in Healthy Colombians. J Bioequiv Availab. 2015;7:229-232.
34. Bustami, R et al. Bioequivalence of Losartan/Amlodipine Fixed Dose Combination Tablets Losanet AM Compared with Concomitant Administration of Single Components of Losartan and Amlodipine Tablets in Healthy Human Volunteers. J Bioequiv Availab. 2015;7:216-224.
35. Vargas M, et al. Fed and Fasting Bioequivalence Study for Two Formulations of Bosentan 125 Mg Tablets in Healthy Colombian People. J Bioequiv Availab. 2015;7:210-215.
36. Muñoz E, et al. Bioequivalence Study of Two Formulations of Escitalopram Oxalate 20 mg Tablets in Healthy Volunteers. J Bioequiv Availab. 2015;7:205-209.
37. Sallam A, et al. Bioequivalence of Two Oral Formulations of Modafinil Tablets in Healthy Male Subjects under Fed and Fasting Conditions. J Bioequiv Availab. 2015;7:063-067.
38. Agatonovic-Kustrin S, et al. Biorelevant Dissolution Studies of Pioglitazone HCL Immediate Release Tablets and the Determination of an In Vitro In Vivo Correlation. J Bioequiv Availab. 2015;7:086-089.
39. Damodar R, et al. Formulation and Evaluation of Fast Dissolving Tablets of Diclofenac Sodium by Novel Hole Technology. J Mol Pharm Org Process Res. 2014;2:116.
40. Malhotra B, et al. Relative Bioavailability Study of an Abuse-Deterrent Formulation of Extended-Release Oxycodone with Sequestered Naltrexone ALO-02 Versus Immediate-Release Oxycodone Tablets in Healthy Volunteers. J Bioequiv Availab. 2014;6:186-191.
41. Zhang X and Zhang S. Bioequivalence Study of Two 30 Mg Tolvaptan Tablets Formulations in Healthy Chinese under Fed Condition. J Bioequiv Availab. 2014;6:181-185.
42. Devineni D, et al. Bioequivalence of Canagliflozin/Metformin Immediate Release Fixed-Dose Combination Tablets Compared with Concomitant Administration of Single Components of Canagliflozin and Metformin in Healthy Fed Participants. J Bioequiv Availab. 2014;6:164-173.
43. Kumari KP, et al. Stability Indicating RP-HPLC method Development and Validation of Salicylic Acid in Choline Magnesium Trisalicilate Trilisate Tablets. J Pharma Care Health Sys. 2014;1:120.
44. Kassem MA and El-Sayed GO. Adsorption of Tartrazine on Medical Activated Charcoal Tablets under Controlled Conditions. J Environ Anal Chem. 2014;1:102.
45. de Figueiredo NB, et al. Determination of 3,4-methylenedioxymethamphetamine MDMA in Confiscated Tablets by High-Performance Liquid Chromatography HPLC with Diode Array Detector. J Forensic Res. 2010;1:106.
46. Damodar R, et al. Role of Novel Hole Technology in Fast Dissolving Tablets. J Mol Pharm Org Process Res. 2014;2:R1-001.
47. Damodar R, et al. Role of Novel Hole Technology in Fast Dissolving Tablets. J Mol Pharm Org Process Res. 2014;2:R1-001.
48. Friedrich C, et al. Bioequivalence of Glucophage® Metformin Tablets from Europe and the United States Tested in Healthy Volunteers. J Bioequiv Availab. 2014;6:061-066.
49. Salem H, et al. Simultaneous Determination of Omeprazole, Tinidazole and Clarithromycin in Bulk Powder and Helicure® Tablets by HPLC. J Chromatograph Separat Techniq. 2014;5:221.
50. Abdul Althaf S, et al. Formulation, Evaluation and Mathematical Modelling of Clopidogrel Bisulphate & Aspirin Immediate Release Bilayer Tablets. Pharmaceut Anal Acta. 2012;3:194.
51. Lokesh PNV, et al. Design, Development and Formulation of Orodispersible Tablets of a Model Drug Using Response Surface Methodology. Pharmaceut Anal Acta. 2012;3:195.
52. Kaale E, et al. The Development and Validation of a Thin Layer Chromatography Densitometry Method for the Analysis of Diclofenac Sodium Tablets. Pharmaceut Anal Acta. 2013;4:202.
53. Bhoya PN, et al. Development and Validation of TLC-Densitometry Method for Simultaneous Estimation of Bisoprolol Fumarate and Hydrochlorothiazide in Bulk and Tablets. J Chromat Separation Techniq. 2012;4:163.

54. Menon S, et al. Bioequivalence and Pharmacokinetic Evaluation of Two Formulations of Armodafinil 250 mg Tablets in Healthy Indian Adult Male Subjects. J Bioequiv Availab. 2013;5: 095-098.
55. Gnana Raja M, et al. Simultaneous, Stability Indicating Method Development and Validation for Related Compounds of Ibuprofen and Paracetamol Tablets by RP-HPLC Method. J Chromat Separation Techniq. 2012;3:155.
56. Ansary A, et al. Simultaneous Determination of Carvedilol and Hydrochlorothiazide in Tablets and Spiked Human Plasma using Derivative Spectrophotometry. Pharmaceut Anal Acta. 2012;3:186.
57. Ahir KB, et al. Simultaneous Estimation of Nebivolol Hydrochloride and Hydrochlorothiazide in Tablets by TLC-Densitometry. J Chromat Separation Techniq. 2012;3:141.
58. Ratnaparkhi MP. Formulation and Development of Taste Masked Orally Disintegrating Tablets of Perindopril Erbumine by Direct Compression Method. Pharmaceut Anal Acta. 2012;3:162.
59. Jagadeeswaran M, et al. Quantitative Estimation of Lopinavir and Ritonavir in Tablets by RP-HPLC Method. Pharmaceut Anal Acta. 2012;3:160.
60. Zou JJ, et al. Bioequivalence Study of Clopidogrel 75 Mg Tablets in Healthy Male Volunteers. J Bioequiv Availab. 2012;4: 006-009.
61. César IC, et al. Bioequivalence Study of Two Oral Formulations of Memantine Tablets in Healthy Brazilian Volunteers after a Single Dose Administration. J Bioequiv Availab. 2012;4: 014-017.
62. Ruiz A, et al. Bioequivalence Evaluation of Two Formulations of Lamotrigine Tablets in Healthy Volunteers. J Bioequiv Availab. 2012;4: 030-034.
63. Usman M, et al. Preparation and Evaluation of Controlled Release Tablets Containing Mefenamic Acid. Clin Exp Pharmacol. 2012;2:107.
64. Qiu X, et al. Pharmacokinetics and Bioequivalence Evaluation of Two Voriconazole tablets: an Open-Label, Single-Dose, Randomized, Two-Way Crossover Study in Healthy Chinese Male Volunteers. J Bioequiv Availab. 2012;4: 044-047.
65. Nanjwade BK, et al. Development and Evaluation of Gastroretentive Floating Tablets of Glipizide Based on Effervescent Technology. J Drug Metab Toxicol. 2012;3:121.
66. Babu B, et al. Pharmacokinetic Evaluation of Metolazone Tablets using Healthy Human Volunteers. J Bioequiv Availab. 2010;2:015-017.
67. Khattak S, et al. Comparative Bioavailability Assessment of Newly Developed Flurbiprofen Matrix Tablets and Froben SR® Tablets in Healthy Pakistani Volunteers. J Bioequiv Availab. 2010;2: 139-144.
68. De Caro V, et al. Galantamine Delivery on Buccal Mucosa: Permeation Enhancement and Design of Matrix Tablets. J Bioequiv Availab. 2009;1:127-134.
69. Bari SB, et al. Application of UV Spectroscopy and First Order Derivative Method for Determination of Tamsulosin Hydrochloride in Bulk and Tablets. Pharm Anal Acta. 2011;2:120.
70. Chatsiricharoenkul S, et al. Bioequivalence Study of 10 mg Olanzapine Tablets in Healthy Thai Volunteers. J Bioequiv Availab. 2011;3:082-085.
71. Patel BDet al. Quantification of Newer Anti-Cancer Drug Clofarabine in their Bulk and Pharmaceutical Dosage Form. J Chromatogr Sep Tech. 2016;7:328.
72. Permender R, et al. Novel Statistically Designed Qbd Methodology for Quantitative Analysis of Nisoldipine in Pharmaceutical Dosage Forms. Pharm Anal Acta. 2016;7:489.
73. Naveed S, et al. Stability of a Dosage Form and Forced Degradation Studies. J Bioequiv Availab. 2016; 8:191-193.
74. Vadlamudi MK and Dhanaraj S. Stability Indicating Method for the Determination of Related Substances in Felodipine Solid Dosage Form and in the Drug Substance by RP-HPLC. J Bioequiv Availab. 2016;8:153-166.
75. Naveed S, et al. UV Spectrophotometric Method for Estimation of Ofloxacin in Tablet Dosage Form and Comparative Study of its Two Brands. J Bioequiv Availab. 2016;8:125-127.
76. Sharma H. Regulatory Inspection of Clinical Trials. Pharmaceutic Regulat Affair. 2012;1:e103.
77. Swain S. Responsibility of Regulatory Affairs in Pharmaceutical Industry. Pharmaceutic Regulat Affair. 2012;1:e104.
78. Hammouda El and Hammouda SE. Outpatient Ambulatory Pharmacy; an Innovation in Dispensing System to Optimize Performance and Meet Standards. Pharmaceutic Regulat Affair. 2012;1:101.

79. Minghetti P and Selmin F. How to Meet Legitimate Expectations of Patients when Authorized Medicinal Products are not Available. Pharmaceut Reg Affairs. 2012;1:e108.
80. Swain S. Mucoadhesive Micro and Nanoparticles for Oral Controlled Drug Delivery System for Prolongation of Gastric Residence and Its Application. Pharmaceut Reg Affairs. 2012;1:e115.
81. James Kirkpatrick C, et al. Non-Equivalence of Antibiotic Generic Drugs and Risk for Intensive Care Patients. Pharmaceut Reg Affairs. 2013;2:109.
82. Swain S and Mishra SS. Drug Regulatory Affairs in Quality Management. Pharmaceut Reg Affairs. 2014; 3:e132.
83. Su K, et al. Preparation of Polymeric Micelles of Curcumin with Pluronic P123 and Assessment of Efficacy against B16 Cells *In vitro*. Adv Pharmacoepidemiol Drug Saf. 2016 ; 5:202.
84. Péron E, et al. Selective Serotonin Reuptake Inhibitors, are They All Equal? A Pharmacoepidemiological Study. Adv Pharmacoepidemiol Drug Saf. 2016;5:203.
85. Lu DY, et al. Anticancer Drug Combinations, Studies for All Possibilities. Adv Pharmacoepidemiol Drug Saf. 2016;5:138.
86. Patil JS. Significance of Particulate Drug Delivery System in Antimicrobial Therapy. Adv Pharmacoepidemiol Drug Saf. 2016;5:139.
87. Alomi YA. National Drug Information Center Program at Ministry of Health in Saudi Arabia. Adv Pharmacoepidemiol Drug Saf. 2016;5:140.
88. Alomi YA, et al. National Drug Information Center Services through Ministry of Health Hotline Calling Center 937 in Saudi Arabia. Adv Pharmacoepidemiol Drug Saf. 2016;5:198.
89. Patil JS. Hydrogel System: An Approach for Drug Delivery Modulation. Adv Pharmacoepidemiol Drug Saf. 2015;4:e135.
90. Patil JS. Novel Tubercular Therapeutic Agents: Need of the Day. Adv Pharmacoepidemiol Drug Saf. 2015; 4:e137.
91. Obara T, et al. Prevalence, Determinants, and Reasons for the Non-Reporting of Adverse Drug Reactions by Pharmacists in the Miyagi and Hokkaido Regions of Japan. Adv Pharmacoepidemiol Drug Saf. 2015;4:191.
92. Teoh BC, et al. Perceptions of Doctors and Pharmacists towards Medication Error Reporting and Prevention in Kedah, Malaysia: A Rasch Model Analysis. Adv Pharmacoepidemiol Drug Saf. 2015;4:192.
93. Vitale G, et al. Development of Psychiatric Symptoms during Antiviral Therapy for Chronic Hepatitis C. Adv Pharmacoepidemiol Drug Saf. 2015;4:193.
94. Oliveira L and Santos Z. Use of Psychotropics and Drug-Drug Interactions in Oncology: Reflections from a Study in a Portuguese Psycho- Oncology Unit. Adv Pharmacoepidemiol Drug Saf. 2015;4:194.
95. Rompikuntal PK and Garlapati S. Antimicrobial Drug Resistance. Adv Pharmacoepidem Drug Safety. 2015;S2:001.
96. Tutar Y. Diazepine Derivative Compounds as Heat Shock Protein 90 Inhibitor in Oncology. Drug Des. .2015;4:e127.
97. Kalaiselvan V, et al. Indian Pharmacopoeia Commission's Partners for Promoting Public Health. Adv Pharmacoepidemiol Drug Saf. 2015;4:181.
98. Kalaivani M, et al. Direct Consumer Reporting of ADRs to PvPI, a Position Paper of Indian Pharmacopoeia Commission. Adv Pharmacoepidemiol Drug Saf. 2015;4:184.
99. IJff DM, et al. Subjectively Perceived Side-Effects of Anti-Epileptic Drugs in Chronic Refractory Epilepsy. Adv Pharmacoepidemiol Drug Saf. 2015;4:186.
100. Kumar N, Jha A. Regulatory Approach to Ensure Quality of Products-An Indian Perspective of Missing Linkage. Pharmaceut Reg Affairs. 2016;5:163.