Iran J Public Health, Vol. 45, No.8, Aug 2016, pp.1098-1099

Letter to the Editor

Bayesian Statistical Methods and Their Valuable Applications in the Pharmaceutical Sciences

*Farzan MADADIZADEH [1, 2], Mohammad EZATI ASAR [3], *Mostafa HOSSEINI [2, 4]*

1. *Noncommunicable Diseases Research Center, Fasa University of Medical Sciences, Fasa, Iran*
2. *Dept. of Epidemiology and Biostatistics, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran*
3. *Research Center for Modeling in Health, Institute for Futures Studies in Health, Kerman University of Medical Sciences, Kerman, Iran*
4. *Pediatric Chronic Kidney Disease Research Center, Tehran, Iran*

***Corresponding Author:** Email: mhossein110@yahoo.com

(Received 16 Mar 2016; accepted 10 Apr 2016)

Dear Editor-in-Chief

Pharmaceutical science as a complement to medical science and a connecting bridge between the patient and the physician plays an important role in maintaining health and preventing diseases. Today, with advances in science and medical technology, as well as diagnosing new diseases, the need to produce useful drugs with low complication is inevitable (1).

Knowledge of investigating the effects of body on the drugs (absorption, distribution and excretion) is called "Pharmacokinetic" (1). Pharmaceutical specialists and researchers in the evaluation of the safety, toxicity and efficacy of new drugs are typically faced with large-scale data that examining the complex relationships among them requires advanced statistical methods. One of the most advanced and efficient statistical approaches are Bayesian methods. These models are based on Bayes' Theorem and in addition to analyzing information contained in the data (Likelihood Function); involve previous researcher's knowledge in the analysis about the considered phenomenon before viewing data (Prior probability distribution). Finally, by combining these two items, they offer more accurate results compared to classical statistical methods (2). Bayesian statistical methods have entered applied competition arena after the discovery of simulation techniques and offered results that are more accurate compared to classical statistical methods (3).

BUGS stands for "Bayesian Inference Using Gibbs Sampling" is the name of a project proposed in 1989 for the application of Bayesian models through simulation approaches such as Gibbs sampling and now is also in progress (4). In recent years, researchers of this large project, for application of Bayesian statistical methods in pharmaceutical science provided a free software called Pharmacokinetic BUGS (PK-BUGS) that pharmaceutical experts can use this software to obtain more accurate results in areas such the discovery of the drugs interaction with each other, discovery of suitable consuming dose for all ages, identifying the damage and drug toxicity and so on (3, 5-9).

The use of Bayesian models and Software PK-BUGS in pharmaceutical science in addition to increasing precision and speeding up the affairs, improve the quality of drugs and thereby reduce costs and develop health system.

Therefore, given that the main concern of the health system and the Food and Drug Department is lowering the cost of drug manufacturing and improving the quality of medical services of the health system, thus creating functional areas and training and applying Bayesian statistical

models are recommended with the help of free PK-BUGS software.

Acknowledgements

The authors declare that there is no conflict of interests.

References

1. Katzung BG, Masters SB, Trevor AJ (2015). *Basic & clinical pharmacology*. 13th ed. McGraw - Hill Inc, Canada, pp: 102-128.
2. Gelman A, Carlin JB, Stern HS, Rubin DB (2014). *Bayesian data analysis*. Boca Raton, FL, USA: Chapman & Hall/CRC, p.89.
3. Lunn D, Jackson C, Best N, Thomas A, Spiegelhalter D (2012). *The BUGS book: A practical introduction to Bayesian analysis*. CRC press, pp:32-39.
4. Ntzoufras I (2011). *Bayesian modeling using WinBUGS* (Vol. 698). John Wiley & Sons, p.15.
5. Kumar P, Herath HS (2015). Bayesian Analysis in Industrial Applications using Markov Chain Monte Carlo Simulations. *Int J Comp Theo Stat*, *2*(1): 49-65.
6. Mentre F, Duffull S, Gueorguieva I, Hooker AC, Leonov S, Ogungbenro K, Retout S (2007). Software for optimal design in population pharmacokinetics and pharmacodynamics: a comparison. *Population Approach Group in Europe (PAGE), Copenhagen, Denmark*.
7. Price K, LaVange L (2014). Bayesian methods in medical product development and regulatory reviews. *Pharm Stat*, 13(1), 1-2.
8. Wan T, Baron K, Zhong W, Brundage R, Elmquist W (2014). Bayesian Approach to Estimate AUC, Partition Coefficient and Drug Targeting Index for Studies with Serial Sacrifice Design. *Pharm Stat*, 31(3), 649-659.
9. Shelley JC, Cholleti A, Frye LL, Greenwood J R, Timlin M R, Uchimaya M (2007). Epik: a software program for pK a prediction and protonation state generation for drug-like molecules. *J Comput Aided Mol Des*, 21(12), 681-691.