ABSTRACT
This review is used to describe the automated dispensing systems increasing opportunities for improving the health care system. Safe automated dispensing systems (ADS) were suitable for providing a patient’s medication therapy when pharmacists are caregivers. This review highlights the use of time-saving technologies such as automated dispensing machines, automated dispensing cabinets, and robotic original pack dispensing systems which have been suggested as potential mechanisms for reducing medication errors, improve accuracy, safety, and efficiency of medication dispensing. The implementation of automated dispensing machines improves the quality of the medication distribution process as compared with Manual Dispensing System. This review also emphasizes the impact of new emerging technologies of an automated dispensing system (ADS) on reducing medication errors and ADE. The Automated dispensing system is a key strategy of improving patient safety through increasing interaction between the patient and pharmacist, resulting in a chance for pharmacists to carry out new clinical functions. This review focus on the practices of automated drug dispensing in different terms in order to reduce the medication errors drug medication process.

Keywords: Automated dispensing system, Medication error, Automated dispensing machine, Decentralized system, Automated dispensing cabinet, Robotic original pack dispensing system.

INTRODUCTION
In recent years, Pharmacists includes various technologies for labour-intensive and time-consuming processes to prepare and distribute medicines. It is reported that both centralized dispensing pharmacies and inpatient care units will grow through the technology which automates drug distribution.1 Safe automated dispensing systems (ADS) are used for ethical pharmacy practice by providing a patient’s medication therapy. ADS are an appropriate way for patients to receive the medicine only when pharmacists are caregivers. The safest automated dispensing systems were achieved by the “five rights”— right drug, right dose, right patient, right route, and the right time.2,3 In 1991, The University Hospital Consortium promotes a "technology statement" upon the automation of services which summarizes that "Strategic plan elements which increase personnel productivity are highly fascinating to attain the organization's financial objectives. In today's strategic plan, Drug delivery automation can be a necessary part of controlling personnel expenses in the hospital pharmacy and the nursing’s budget part is responsible for the administration and charting of drugs.4 Currently, automated drug distribution systems (ADDS) were manufactured by Pyxis, Inc., and Omnicell, Inc. was implying a change in drug distribution started in the 1960s in the United States as unit-dose systems. Unit-dose systems were replaced with a previous approach referred to as multiple-dose drug distribution systems. When nurses had whole responsibility for the overall medication system, from administering multiple doses of the drug to dose preparation termed as Multidose systems. Whereas, in Unit-dose systems, nurses provide single packaged and labelled doses with a duration of more than 8-hour intervals under the administration schedule.5,6 Due to this, unit-dose systems reduced the chances of medication errors, time management of pharmacists as well as nurses, and dosing frequency is reduced.7-10 Automated dispensing systems (ADS) were divided into three categories i.e., point-of-care, decentralized, and centralized. Decentralized systems generally occur outside the control of pharmacist’s while the pharmacist must still identify correction of the various steps by ensuring the right drug dose availability in the right location in a dispensing cabinet through accessing the storage cabinet by the caregiver to which the right dose is accurately administered to the right patient. Point-of-care systems are as same as decentralized systems. Pharmacists were in direct control of the dispensing process in Centralized systems. ADS development involves three goals i.e., a) By utilizing rapid developing technology into a safe medication process, b) Direct patient care by the pharmacists, c) Minimization of cost. 11,12 Today, automation in drug dispensing includes packaging of drugs, controlling software, computer-assisted physician order
entry, dispensing cabinets, the automated generation of customizable forms and reports, and robotic handling.  

1.1 Automated Dispensing Technologies

There are various automated dispensing technologies present in the market such as:

a) Automated Dispensing Machine (ADM),
b) Automated dispensing cabinets, and
c) Robotic original pack dispensing system.

1.1.1. Automated Dispensing Machine (ADMs)

The implementation of the Automated Dispensing Machine (ADMs) in the dispensing process involves improving the quality of the medication distribution process and the effective utilization of human resources. It was reported that ADMs reduced the dispensing time of pharmacists but pharmacists needed more time to provide more intelligent services like patient care-related activities.

Comparison between Manual Dispensing System/Automated Dispensing System/Modified Automated Dispensing System

Manual Dispensing System (Manual system)

The dispensing process was initiated with the screening of prescriptions through a pharmacist processed by a pharmacy technician recording the medication order, labelling a zip-locked bag, and matching it with the prescription.

Then, the pharmacy technician calculates the medications and place it in the prepared bag, and a pharmacist again verifies the medication to an inpatient ward before dispensing for accuracy.

Figure 1: Work process of Manual Dispensing System.

Automated Dispensing System (ADM system)

Initially, a prescription was checked by a pharmacist for the dispensing process and recorded by a pharmacy technician. Then a pharmacist verified the prescription and data was transferred to the ADM for preparation. The medications were filled through the ADM in unit dose packages, and automatically a label was printed and placed on each unit dose package. A pharmacy technician with the help of the ADM cut the strip-packaged medication for each patient, matched it with the prescription, and screened for the flexibility of the dispensed unit dose.

Figure 2: Work process of Automated Dispensing System.

Modified Automated Dispensing System (Modified ADM system)

The modified ADM system minimizes the dispensing process and reduces the human resource requirement along with improving the quality of patient care by utilizing the work process of the ADM system.

The ADM system was modified to increase the efficiency of the ADM system for decreasing the workload, and designed to cover functions as stock management and dispensing.

The final screening of the dispensing process for the accuracy of the medication before its delivery to the inpatient ward was conducted by a pharmacy technician with no involvement of the pharmacist.

The pharmacy technician manages the ADM for filling of medications concerning stock management.

Figure 3: Work process of Modified Automated Dispensing System.
1.1.2. Automated dispensing cabinet (ADCs)

Automated dispensing cabinets were also referred to as automated distribution devices which were prepared not only to prevent the errors and replace human activity but also to support humans in clinical decision making. ADCs must identify the risks and promote the safe practice of reducing medication errors. ADC was utilized for different decentralized drug distribution including in outpatient areas, like the emergency department.

ADC has the potential for providing safety advantages such as improving efficiency among pharmacy and nursing disciplines, and the capacity to monitor inventory and hinder drug deviation through accurate medication tracking and record-keeping. ADC was significant for the use of patient profiling systems to pull out medication from the pharmacy and nursing disciplines, and the capacity to monitor inventory and hinder drug deviation through accurate medication tracking and record-keeping. ADC was utilized for different decentralized drug distribution including in outpatient areas, like the emergency department.

1.1.3. Robotic dispensing system

Robotic original pack dispensing system has been recommended for improving safety, performance, and enhancing the storage capacity to which it stores and retrieves automatically the medication depending upon the barcode on the product. The rate of dispensing errors was reduced by the implementation of a robotic original pack dispensing system and optimized stock management. While dispensing robots do not handle all the packages so, residual manual dispensing was also utilized in the post-robotization phase but in both the phase the original packs were directly delivered by the technicians to the patient without previous labelling. At the pre-implementation phase, a barcode-controlled system was used for dispensing the drug manually by the technicians while the dispensing robot ROWA Vmax (ARX) was utilized at the post-implementation phase for dispensing the drug.

1.2 Impact of technologies on reducing medication errors and ADEs

The new emerging technologies such as computerized medication administration records (CMARs), computerized physician order entry (CPOE), automated dispensing machines (ADMs), and barcoding has a potential effect in reducing medication errors and adverse drug events (ADEs) as shown in Fig 4.

1.3 Insight to reduce the medication error by the implementation of automated drug dispensing:

Chapuis et al evaluated the automated dispensing system which impacts the incidence of medication errors associated with preparation, administration, and picking of drugs in a medical intensive care unit and estimated the clinical significance of such errors and user satisfaction.

Design: Post-intervention and pre-intervention study consisting of control along with an intervention medical intensive care unit.

Setting: 2,000-bed university hospital was conducted under two medical intensive care units.

Patients: Adult medical intensive care patients.

Interventions: The implementation of an automated dispensing system was chosen randomly in a study unit after a 2-month observation, with other units was remaining under control. Measurements and Main Results: The rate for overall error was indicated by percentages which were categories by an expert committee under the National coordinating Council for Medication

![](image_url)
Error Reporting and Prevention. Self-administered questionnaires were assessed by nurses for user satisfaction. Hence, a total of 1,476 medications for 115 patients were observed. In this study, it was examined that after implementation of the automated dispensing system, a reduced percentage of total opportunities for error was observed compared to the control unit (13.5% and 18.6%, respectively; \( p < .05 \)), therefore, no significant difference was noticed before the implementation of the automated dispensing system (20.4% and 19.3%, respectively; not significant). Thus, in this study, a significantly reduced percentage of total opportunities for error was noted before-and-after comparison (20.4% and 13.5%; \( p < .01 \)). The impact of the automated dispensing system in reducing preparation error (\( p < .05 \)) was analysed significantly for error. Finally, for working conditions, the mean was improved from 1.0-0.8 to 2.5-0.8 on the four-point Likert scale.

Outcomes: overall medication errors accompanied to preparation, administration, and picking of drugs were reduced by the implementation of an automated dispensing system in the intensive care unit. Additionally, the new drug dispensation organization was favoured by more nurses.41-50

Cousin et al analysed the automated drug distribution system and their impact on medication errors (MEs).

Methods: Observational study before and after in a Valenciennes, France 40-bed short-stay geriatric unit within an 1800 bed general hospital. When the drug distribution system changed before and after from ward stock system (WSS) to a unit dose dispensing system (UDDS), thus researchers had examined the nurses’ medication administration rounds and compared to the prescribed drugs through the integration of unit dose dispensing robot and automated medication dispensing cabinet (AMDC).

Results: It was evaluated that about 148 patients were observed total 615 opportunities of errors (OEs) treated during the ward stock system (WSS) period thereby; among 166 patients observed 783 OEs were treated during unit-dose dispensing system (UDDS) period. Thus, the two periods were compared and calculated by medication administration error (MAE). In addition, type of errors, risk reduction as well as the seriousness of errors was measured for the patients. Hence, an automated drug dispensing system was estimated and show results in a 53% reduction in MAEs where all type of error was minimized in the UDSS period than in the WSS period (\( P < 0.001 \)). Thus, there was a reduction of 79.1% in the wrong dose and 93.7% in wrong drug errors respectively.

Outcomes: The medication safety was improved among the elderly by the implementation of an automated UDSS due to the combining effect of unit dose dispensing robot and automated medication dispensing cabinet (AMDCs) significantly reduces discrepancies between ordered and administered drugs.53-59

Lisby et al investigate the type, frequency, and consequence of medication error in more stages of medication process including discharge summaries.

Design: three methods i.e. direct observations, unannounced control visits, and chart reviews were utilized to detect the errors in the medication process under cross-sectional study. Thus, all potential medication error and their consequences were evaluated by physicians and pharmacists in discharge summaries.

Setting: A randomly selected medical and surgical department at Aarhus University Hospital, Denmark.

Study participants: In this, the age group i.e. 18 or over (n=64) were eligible in hospital patients where nurses were dispensing and administering the drugs and physicians prescribing the drugs.

Main outcome measures: Clinical consequences of all detected errors and their frequency, type, and potential were compared with the total number of opportunities for error.

Results: Here, about 2467 opportunities for errors detected about 1065 errors in the medication process assessed as potential adverse drug events. Thus, the frequency of medication errors at each stage was ordering 39%, transcription: 56%, dispensing: 4%, administration: 41%, and at last discharge summaries: 76%. Hence, due to the lack of drug form, the omission of drug/dose, unordered drug and lack of identity control were common types of error occur throughout the medication process.

Outcomes: By the implementation of automated drug dispensing technologies in the medication process, the number of errors could be reduced through the involvement of simple changes of existing procedures and their quality was improved up to 50% reduced all errors in dose and prescriptions in the medication process.60-68

CONCLUSION

Automated dispensing systems revolutionize the health care system with the improvement in the quality of the medication dispensing process by utilizing time-saving automated dispensing technologies. The quality of the medication distribution process was improved with the implementation of the Automated Dispensing Machine (ADMs). Different automated dispensing technologies have the potential for reducing medication errors, improving safety, enhancing the efficiency, and accuracy of the dispensing process. Hence, this review concluded the practises of automated drug dispensing technologies on the reduction of medication error during the medication process as by the implementation of the automated dispensing system reduced overall medication errors related to picking, preparation, and administration of drugs. By the implementation of an automated UDSS due to the combining effect of unit dose dispensing robot and automated medication dispensing cabinet (AMDCs) significantly reduces discrepancies between ordered and administered drugs. By the implementation of automated
drug dispensing technologies in the medication process, the number of errors could be reduced through the involvement of simple changes of existing procedures, and their quality was improved up to 50% reduced all errors in dose and prescriptions in the medication process.

REFERENCES

1. Rawley MG, Nickman NN, Jorgenson JA, Work activities before and after implementation of an automated dispensing system, Am J Health-Syst Pharm, 1996; 53:548-554, doi: 10.1093/ajhp/53.5.548; PMID: 8697015

2. Ferencz N, Safety of Automated Dispensing Systems, US Pharm, 2014; 39(8):8-12, doi: https://www.uspharmacist.com/article/safety-of-automated-dispensing-systems

3. Simborg DW, Derewicz HJ, A highly automated hospital medication system, Five years’ experience and evaluation, Annals internal med, 1975; 83:342-346, doi: 10.7326/0003-4819-83-3-342; PMID: 1180430

4. Hynninmae CE, Conrad WF, Urch WA, A comparison of medication errors under the University of Kentucky unit dose system and traditional drug distribution systems in four hospitals, Am J Hospital Pharm, 1970; 27: 802-814, PMID: 5473470

5. Riley AN, Derewicz HJ, Lamy PP, Distributive costs of a computer-based unit dose drug distribution system, Am J Hospital Pharm, 1973; 30:213-219, PMID: 4690479

6. Shultz SM, White SJ, Latiolais C J, Medication errors reduced by unit-dose, Hospitals, 1973; 47:106-112, PMID: 4706537

7. Balka E, Nutland K, Automated Drug Dispensing Systems: Literature Review, Action for health, 2004;6: 1

8. Brookins L, Burnette MBA, Cooley TW, ASHP guidelines on the safe use of automated dispensing devices, Am J Health Syst Pharm, 2010; 67: 483–90, doi: 10.2146/sp100004, PMID: 20208056

9. Wise LC, Bostrom J, Crosier JA, Cost-benefit analysis of an automated medication system, Nurs Econ, 1996;14:224–31, doi: 10.1016/j.jval.2017.03.001, PMID: 28712617

10. Guerrero RM, Nickman NA, Jorgenson JA, Work activities before and after implementation of an automated dispensing system, Am J Health Syst Pharm, 1996; 53:548–54, doi: 10.1093/ajhp/53.5.548, PMID: 8697015

11. Schwarz HO, Brodowy BA, Implementation and evaluation of an automated dispensing system, Am J Health Syst Pharm, 1995;52:823–8, doi: 10.1093/ajhp/52.8.823, PMID: 7634117

12. Noparatayaporn P, Sakulburunrueng S, Thaweeothamcharoen T, Comparison on Human Resource Requirement between Manual and Automated Dispensing Systems, Value in health regional issues, 2017; 5: 107 – 111, doi: 10.1016/j.vhr.2017.03.007 PMID: 28648307

13. Findlay R, Webb A, Lund J, Implementation of advanced inventory management functionality in automated dispensing cabinets, Hosp Pharm, 2015; 50(7): 603-608, doi: 10.1310/hpj5007-603 PMID: 26448672

14. McCarthy Jr BC, Ferker M, Implementation and optimization of automated dispensing cabinet technology, Am J Health Syst Pharm, 2016; 73(19): 1531-1536, doi: 10.2146/ajhp150531 PMID: 27646814

15. Fanning L, Jones N, Manias E, Impact of automated dispensing cabinets on medication selection and preparation error rates in an emergency department: a prospective and direct observational before-and-after study, J Eval Clin Pract, 2016; 22(2): 156-163, doi: 10.1111/jep.12445 PMID: 26346850

16. Grissinger M, Safeguards for using and designing automated dispensing cabinets, P T, 2012; 37(9): 490-530, PMID: 23066340

17. Roman C, Poole S, Walker C, A “time and motion” evaluation of automated dispensing machines in the emergency department, Australas Emerg Nurs J, 2016; 19(2): 112-117, doi: 10.1016/j.aenj.2016.01.004 PMID: 26987705

18. Billstein-Leber M, Carillo CJD, Cassano AT, ASHP guidelines on preventing medication errors in hospitals, Am J Health Syst Pharm, 2018; 75(19): 1493-1517, doi: 10.2146/ajhp170811 PMID: 30257844

19. Leape LL, Brennan TA, Laird N, The nature of adverse events in hospitalized patients, Results of the Harvard Medical Practice Study I, N Engl J Med, 1991; 324: 377-384 The nature of adverse events in hospitalized patients, Results of the Harvard Medical Practice Study II, doi: 10.1056/NEJM199102073240605 PMID: 1824793

20. Bates DW, Cullen DJ, Laird N, Incidence of adverse drug events and potential adverse drug events, Implications for prevention, ADE Prevention Study Group, JAMA, 1995; 274:29–34, PMID: 7791255

21. Taxis K, Dean B, Barber N, Hospital drug distribution systems in the UK and Germany a study of medication errors, Pharm World Sci, 1999; 21:25–31, doi: 1023/a:1008616622472, PMID: 10214665

22. Anselmi ML, Peduzzi M, Dos Santos CB, Errors in the administration of intravenous medication in Brazilian hospitals, J Clin Nurs, 2007; 16:1839–1847, doi: 10.1111/j.1365-2702.2007.01834.x, PMID: 17880472

23. Barker KN, Flynn EA, Pepper GA, Medication errors observed in 36 health care facilities, Arch Intern Med, 2002; 162: 1897–1903, doi: 10.1001/archinte.162.16.1897, PMID: 12196090

24. Calabrese AD, Erstad BL, Brandl K, Medication administration errors in adults in the ICU, Intensive Care Med, 2001; 27:1592–1598, doi: 10.1007/s001340101065, PMID: 11685299

25. Rothschild JM, Landrigan CP, Cronin JW, The Critical Care Safety Study: The incidence and nature of adverse events and serious medical errors in intensive care, Crit Care Med, 2005; 33:1694–1700, doi: 10.1097/01.ccm.0000171609.91035.bd, PMID: 16096443

26. Fahimi F, Ariapanah P, Faizi M, Errors in preparation and administration of intravenous medications in the intensive care unit of a teaching hospital: An observational study, Aust Crit Care, 2008; 21:110–116, doi: 10.1016/j.aucr.2007.10.004, PMID: 18387813

27. Van den Bent PM, Fijn R, van der Voort PH, Frequency and determinants of drug administration errors in the intensive
42. Shirley KL, Effect of an automated dispensing system on medication administration time, Am J Health Syst Pharm, 1999; 56: 1542–1545, DOI: 10.1093/ajhp/56.9.1542, PMID: 10478994

43. Manasse HR, Ferner RE, Anton C, Increase in US medication-error deaths, Lancet, 1998; 351:1655–1656, doi:https://www.ncbi.nlm.nih.gov/books/NBK225182/pdf/Bookshelf_NBK225182.pdf

44. Landrigan CP, Parry GI, Bones CB, Temporal trends in rates of patient harm resulting from medical care, New England Journal of Medicine, 2010; 363 (22): 2124–2134, DOI: 10.1056/NEJMc0100440

45. Bates DW, Teich JM, Lee J, The impact of computerized physician order entry on medication error prevention, J Am Med Inform Ass, 1999; 6 (4): 313–321, doi: 10.1136/jamia.1999.00660313, PMID: 10428004

46. Poon EG, Keohane CA, Yoon CS, Effect of bar-code technology on the safety of medication administration, New England J Med, 2010, 362 (18): 1698–1707, DOI: 10.1056/NEJMoa0907115

47. Schimmel AM, Becker ML, Van Den Bout T, The impact of type of manual medication cart filling method on the frequency of medication administration errors: a prospective before and after study, Int J Nursing Studies, 2011; 48 (7): 791–797, DOI: 10.1016/j.ijnurstu.2010.12.007

48. Barker KN, The effects of an experimental medication system on medication errors and costs. I Introduction and errors study, Am J Hospital Pharm, 1969; 26 (6): 324–333, doi: https://doi.org/10.1093/ajhp/26.6.324

49. Paparella S, Automated medication dispensing systems: not error free, J Emergency Nursing, 2006; 32 (1): 71–74, DOI: 10.1016/j.jen.2005.11.004, PMID: 16439294

50. Flynn EA, Barker KN, Pepper GA, Comparison of methods for detecting medication errors in 36 hospitals and skilled nursing facilities, Am J Health-System Pharm, 2002; 59(5): 436–446, DOI: 10.1093/ajhp/59.5.436, PMID: 11887410

51. Cousen E, Mareville J, Leroy A, Effect of automated drug distribution systems on medication error rates in a short-stay geriatric unit, J Eval Clinical Practice, 2014; 20: 678–684, DOI: 10.1111/jep.13200, PMID: 24917185

52. Allan EL, Barker KN, Fundamentals of medication error research, Am J Hospital Pharm, 1990; 47 (3): 555–571, PMID: 2180287

53. Fontan JE, Maneglier V, Nguyen VX, Medication errors in hospitals: computerized unit dose drug dispensing system versus ward stock distribution system, Pharm World Sci, 2003; 25(3): 112–117, DOI: 10.1023/a:1024053514359, PMID: 12840964

54. Van den Bent PM, Idzenga JC, Robertz H, Medication administration errors in nursing homes using an automated medication dispensing system, J Am Medical Informatics Asso, 2009, 16(4): 486–492, doi: 10.1197/jamia.M2959, PMID: 19990109

55. Thomas EJ, Studdert DM, Burstin HR, Incidence and types of adverse events and negligent care in Utah and Colorado, Med Care, 2000;38:261–271, DOI: 10.1097/00005650-200003000-00003, PMID: 10718351
56. Brennan TA, Leape LL, Laird N, Incidence of adverse events and negligence in hospitalized patients, Results of the Harvard Medical Practice Study I, N Engl J Med, 1991; 324: 370–375, DOI: 10.1056/NEJM199102073240604

57. Wilson RM, Runciman WB, Gibberd RW, The Quality in Australian Health Care Study, Med J Aust, 1995; 163: 458–471, DOI: 10.5694/j.1326-5377.1995.tb124691.x, PMID: 7476634

58. Kaushal R, Bates DW, Landrigan C, Medication errors and adverse drug events in paediatric inpatients, J Am Med Assoc, 2001; 285: 2114–2120, doi:10.1001/jama.285.16.2114

59. Gandhi TK, Seger DL, Bates DW, Identifying drug safety issues: from research to practice, Int J Qual Health Care, 2000; 12: 69–76, DOI: 10.1093/intqhc/12.1.69, PMID: 10733086

60. Lisby M, Nielsen LP, Mainz J. Errors in the medication process: frequency, type, and potential, Int J Quality in Health Care, 2005; 17: 15–22, DOI: 10.1093/intqhc/mzi015, PMID: 15668306

61. Morrill GB, Barreuther C, Screening discharge prescriptions, Am J Hosp Pharm, 1988; 45: 1904–1905, PMID: 3228124

62. Wilkin TJ, Christopher LJ, Crooks J, Transcription errors in the drug information supplied from hospital to general practitioner, Health Bull (Edinb), 1978; 36: 13–16,doi: https://www.semanticscholar.org/paper/Transcription-errors-in-the-drug-information-from-Wilkin-Dodd/722ccc721abd0cf32bb4b785d5c4a4ca5769ace3

63. Wilson S, Warwick R, Chapman M, General practitioner hospital communications: A review of discharge summaries, J Qual Clin Pract, 2001; 21: 104–108, DOI: 10.1046/j.1440-1762.2001.00430.x

64. Folli HL, Poole RL, Benitz WE, Medication error prevention by clinical pharmacists in two children’s hospitals, Pediatrics, 1987; 79: 718–722, PMID: 3575028

65. Dean BS, Barber ND, Schachter M, What is a prescribing error? Qual Health Care, 2000; 9: 232–237, DOI: 10.1136/qhc.9.4.232, PMID: 11101708

66. Wirtz V, Taxis K, Barber ND, An observational study of intravenous medication errors in the United Kingdom and in Germany, Pharm World Sci, 2003; 25: 104–111, DOI: 10.1023/a:1024009000113, PMID: 12840963

67. Patterson ES, Cook RI, Render M, Improving patient safety by identifying side effects from introducing bar coding in medication administration, J Am Med Inform Assoc, 2002; 9:540–553, DOI: 10.1197/jamia.m1061, PMID: 12223506

68. Thornton PD, Simon S, Mathew TH, Towards safer drug prescribing, dispensing and administration in hospitals, J Qual Clin Pract, 1999; 19: 41–45, doi: https://doi.org/10.1046/j.1440-1762.1999.00290.x

Source of Support: The author(s) received no financial support for the research, authorship, and/or publication of this article.

Conflict of Interest: The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

For any question relates to this article, please reach us at: editor@globalresearchonline.net

New manuscripts for publication can be submitted at: submit@globalresearchonline.net and submit_ijpsrr@rediffmail.com