ScieniQ Publishers

Japan Journal of Medical Science

Review Article

ANTIRETROVIRAL DRUGS SUPPLY CHAIN MANAGEMENT IN NIGERIA: A NARRATIVE REVIEW

Obadiah Ejem Enemushie[1,5], Ogbonna Chigozie A[4], Ogudu Friday O[4], Umeh Ifeoma B[1], Nnamani Monica N[3], Anetoh Maureen U[3], Ogbonna Brian O[2,3]

1Department of Clinical Pharmacy and Pharmacy Management, Faculty of Pharmaceutical Sciences, Nnamdi Azikiwe University, Awka, Nigeria
2International Institute for Health Policy, Systems and Knowledge Translation, David Umahi Federal University of Health Sciences, Uburu Nigeria
3Department of Clinical Pharmacy and Pharmacy Practice, Faculty of Pharmacy, David Umahi Federal University of Health Sciences, Uburu, Nigeria.
4Department of Anaesthesia, Faculty of Clinical Medicine, David Umahi Federal University of Health Sciences, Uburu, Nigeria
5Department of Logistics and Supply Chain Management, Faculty of Pharmaceutical Sciences, Nnamdi Azikiwe University, Awka, Nigeria

Corresponding author
Ogbonna Brian, Department of Clinical Pharmacy and Pharmacy Practice, Faculty of Pharmacy, David Umahi Federal University of Health Sciences, Uburu, Nigeria

Received: 02 April 2026
Accepted : 17 April 2026
Published: 13 May 2026

Abstract

Background: Antiretroviral drugs (ARVs) are critical to the management and treatment of HIV/AIDS, a disease that has claimed millions of lives in Nigeria. Despite progress in the availability of ARVs in the country, achieving and maintaining consistent drug supply remains a challenge, particularly in rural areas. This narrative review explores the supply chain management of ARVs in Nigeria, examining the factors that enable or hinder the effectiveness of the system.

Objective: The objective of this review study is to provide a comprehensive and critical overview of the existing literature on the subject by analyzing the progress and challenges associated with the supply chain management of ARVs in Nigeria, identify the key factors that have contributed to the success or failure of ARV supply chain management and to make recommendations for improving the supply chain management effectiveness of ARVs in the country.

Keywords: Antiretroviral drugs (ARV), HIV/AIDS, Supply chain management, Nigeria, Funding, Logistics, Procurement, Distribution and Inventory management (stock - out), Logistics Information Management, Healthcare system, NGOs

Introduction

Antiretroviral drugs (ARV) are life saving drugs used in the treatment, prevention and control of HIV/AIDS and as defined by the World Health Organization (WHO), access to medicine supply should be made a priority for every citizen of a country with a functioning supply chain management system with adequate logistics management information system that bridges the gap between non availability of inventory during stock out and procurement of identified products as well as proper distribution planning and storage facilities. A study by Ijeoma et al 2013, identified that HIV/AIDS is one of the major public-health problems worldwide, affecting mostly people who are at the most productive stage of life and out of the estimated 34 million people living with HIV/AIDS globally as at the end of 2010, 68% reside in Sub Saharan Africa [1]. With Nigeria having an HIV prevalence of 4.1% and currently an estimated 3.6 million people are living with HIV/AIDS [2], which puts Nigeria as the second country with the largest number of people living with HIV (PLWHA) after living with HIV/AIDS in West Africa South Africa. Nigeria's HIV program has benefited from international support from organizations such as the Global Fund to Fight AIDS, Tuberculosis and Malaria, and the US President's Emergency Plan for AIDS Relief (PEPFAR), which has enabled the country to access essential drugs and services. The supply chain for ARVs is complex and faces various challenges, which have often led to stock-outs, wastage, delays, and other problems. Abubakar et al 2021, Stock-out associated with antiretroviral drugs in treatment facilities is one of the factors that can impede the achievement of positive clinical outcome in the treatment of HIV/AIDS [1]. The frequent stock-outs of antiretroviral drugs were attributed to the increasing HIV client loads. It was indicated that the increasing patient population were not being properly documented by healthcare facilities. As a result, proper ART commodity quantification is impeded which in turn impacted on requisitions [5]. Another key challenge is the lack of proper coordination and collaboration among stakeholders involved in the supply chain. Nigeria has a large health system with multiple actors, including the government, donors, nongovernmental organizations, and private entities. Despite efforts to harmonize

their activities, there is still a lack of strategic alignment, data sharing, and communication, which affects the efficiency and effectiveness of drugs supply. This is often compounded by inadequate funding and human resources, weak infrastructure, and poor governance as well as miscommunication. Another challenge is the limited accessibility and availability of ARVs in rural areas. While urban areas have more health facilities and resources, rural areas are underserved, and patients, especially women and children, face difficulties accessing and receiving treatment. A study by Samson Aturuka, 2017, shows that supplies often get interrupted for many reasons, including intra and inter professional conflicts, industrial strike, poor availability of resources to manage logistics, non-availability of transportation means, lack of technical knowhow on the part of the health care workers, poor donor support among several others.

The consequence of supply interruption can be dire, including antibiotic and anti-retroviral drug resistance, which could have a wider global impact on the availability of drugs for treatment. Several reasons for the complexity of commodity management of HIV/AIDS programs on systemic level are drug resistance; rapidly changing technologies, lack of reliable data on prevalence rates, stigmatization and cultural barriers may impact number of people accessing services, inadequate data from logistics report at the service delivery points, poor attitude of health facility personnel, poor capacity of health staff and frequent Equipment breakdown [3]. As a result, patients in these areas often resort to self-medication, buying substandard drugs from unregulated sources, or failing to follow up on their treatment plans, which can lead to drug resistance and other complications. To address these challenges, stakeholders need to collaborate more effectively, with a focus on improving the overall supply chain management of ARVs in Nigeria. This requires a strong political commitment, increased funding, enhanced data-driven planning, and strengthened regulation and oversight. Additionally, there need to be a systematic approach to addressing the specific needs of different populations, including those in rural areas, through the provision of patient-centered care, community engagement, and innovative delivery models. Several literatures have identified challenges facing the supply chain management of ARVs in Nigeria, to include government laxity towards funding thereby relying totally on donors, poor coordination between stakeholders, and limited infrastructure. The study also highlighted the need for innovative strategies, such as the use of mobile technology, to improve the efficiency and effectiveness of the supply chain. Also, a study by Innocent et al 2012, identified areas on which the Government of Nigeria should focus attention in health supply chain strategy, which is currently perceived as not coordinated [2]. The area pointed out was funding of which the government has always relied on donors for any health program including mobilization of health staff for a smooth run. Finally, efforts to strengthen the supply chain must be matched with those aimed at improving capacity, quality assurance, and sustainability of ARV programs in Nigeria. The objective of this review study is to provide a comprehensive and critical overview of the existing literature on the subject by analyzing the progress and challenges associated with the supply chain management of ARVs in Nigeria, identify the key factors that have contributed to the success or failure of ARV supply chain management in Nigeria and to make recommendations for improving the supply chain management effectiveness of ARVs in the country.

METHODS

Study location: This study seeks to cover studies carried out on the challenges of ARVs supply chain management in Nigeria from 2000 – 2022.
Study design: This study is a narrative review of antiretroviral drugs supply chain management in Nigeria.

Study setting: Only Studies that examine the challenges faced by ARV supply chains in Nigeria - Studies that propose solutions or recommendations for strengthening ARV supply chains in Nigeria were used for the study.

Study period: The study covered the period from 2000 – 2022.

Sources of data: Data was obtained from research gate, Google scholar, AI assistant models and PubMed.

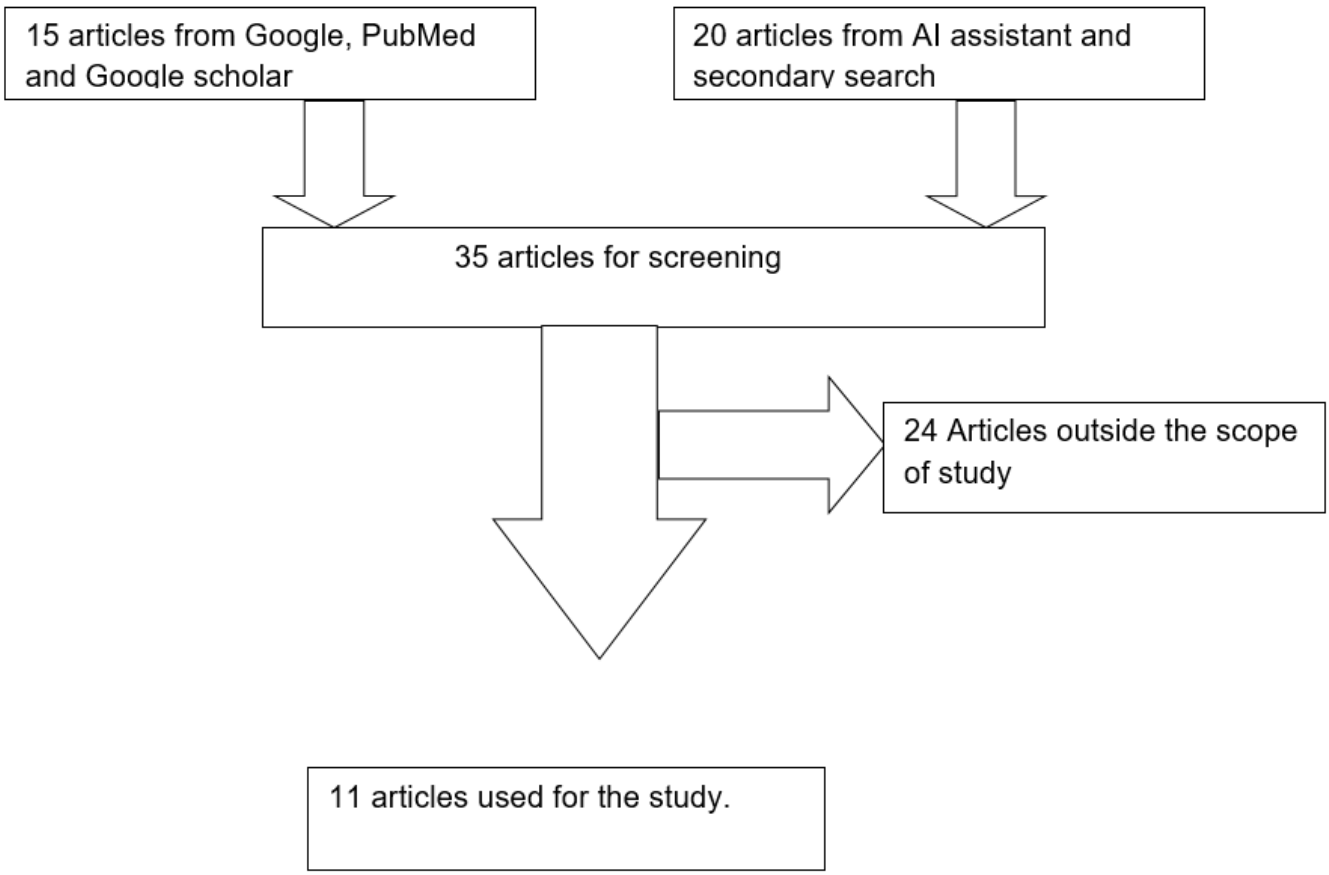
Inclusion criteria: Studies carried out in Nigeria from 2000 – 2022 in ARV drugs supply chain management were used for the study. Studies written in English with clearly stated methods in line with scientific principles. Studies that explore the different aspects of ARV supply chain management, such as procurement, storage, distribution, and monitoring.

Exclusion criteria: Studies carried out within the stipulated period with incomplete data, unclear, and ambiguous methods were excluded.

Data extraction: The key words were searched in series, and through truncation. Relevant search terms were used in appropriate combinations using relevant search terms due to some studies which have not yet been indexed in key data bases. Abstracts of relevant papers were also screened for relevance.

Data analysis: Data was analyzed through simple descriptive statistics.

Data presentation: Data is presented in evidence based tables.



RESULTS

Table 1: Evidence -based table of ARV supply chain management in Nigeria.

Reference No;	Reference	Title	Year	Study design	Data collection tools	Outcomes	Location
[1]	Ijeoma Okoronkwo, Uchenna Okeke, Anthonia Chinweuba, Peace Iheanacho, 2013.	Non-adherence Factors and Socio-demographic Characteristics of HIV-Infected Adults Receiving Antiretroviral Therapy in Nnamdi Azikiwe University Teaching Hospital, Nnewi, Nigeria	2013	Cross Sectional study	Questionnaire	Non-adherence rate, reasons, knowledge, attitude and limitations.	Nnewi, Anambra State.
[2]	Innocent Ibegbunam, Deborah McGill, 2012	Journal of Humanitarian Logistics and Supply Chain Management; Health commodities management system: priorities and challenges	2012	Qualitative research	Interviews	Need for coordination amongst stakeholders, limitations and time constraints	Abuja

[3]	Iyeseun O. Asieba, Dorothy A. Oqua, Anthony A. Wutoh, Kenneth A. Agu, Onuche I. Omeh, Zainab A. Adeyanju, Afusat Adesina, Festus Agu, Peter Agada, Anthony Achanya, Nnenna Ekechuwu, Toyin Tofade, 2020.	Antiretroviral therapy in community pharmacies - Implementation and outcomes of a differentiated drug delivery model in Nigeria.	2020	Retrospective analysis	Interviews and Survey	Consumer satisfaction, community pharmacies practices on refill program, limitations	Nigeria
[4]	John T. Mentzer Ph.D., Theodore P. Stank Ph.D., Terry L. Esper Ph.D, 2011.	Supply chain management and its relationship to logistics, marketing, production, and operations management.	2011	Cross Sectional study	Questionnaire	Global supply chain management practices, Collaborations.	Global survey
[5]	Victory O. Olutuase, Chinwe J. Iwu-Jaja, Cynthia P. Akuoko, Emmanuel O. Adewuyi, Vishnu Khana, 2022	Medicines and vaccines supply chains challenges in Nigeria	2022	Scoping review	Scopus and web of science (WOS) databases.	Problems associated with vaccine selection, stock-outs, Practices, limitations.	Nigeria
[6]	Ogbonna BO Ph.D., 2016	National drug distribution in Nigeria; implications for the goals of National Drug Policy	2016	Article	Survey	Challenges and milestones of policies of drug distribution system for a sustainable drug supply chain, practices.	Nigeria
[7]	Lisa Hare, John Snow, Inc. 2012.	Logistics Management Information Systems (LMIS), PSM WG Meeting	2012	Cross sectional study	Survey	Importance of LMIS in drugs supply chain, collaborations, practices.	Sub-Saharan Africa
[8]	Abubakar Mustapha Danraka, Godspower Onavbavba, 2021.	Stock-out of Antiretroviral Drugs: A Cross Sectional Study in Selected Health Facilities in Federal Capital Territory, Nigeria.	2021	Cross sectional study	Questionnaire	Stock-outs of ARVs as a result of insufficient data and increasing infection rate.	Abuja

[9]	Samson Aturuka, 2017.	Logistic Challenges Associated with Supply Chain Management of HIV/AIDS Programs in Cross River State, Nigeria.	2017	Descriptive cross sectional explorative study	Checklist, Questionnaire	Drugs expiration due to over forecasting, poor infrastructure and low response from PLWH as a result of stigma, Limitation.	Cross River State.
[10]	USAID DELIVER project, 2005.	Handbook on guidelines for managing HIV/AIDs supply chain.	2005	Hand book	Survey	Detailed and well structured guidelines of health commodities supply chain planning, design, management and limitations.	Sub-Saharan Africa.
[11]	USAID DELIVER project, 2006.	USAID handbook on supply chain management of antiretroviral drugs.	2006	Handbook	Survey	Stakeholder's collaboration, importance of LMIS in ARV supplies chain.	Sub-Saharan Africa.

Table 2: Partnership Agencies/Stakeholders in ARV Supply Chain Management in Nigeria.

S/n	Variables	n	%
1.	NGO's	4	40
2.	Government agencies/ Ministries	3	20
3.	Community groups	2	10
4.	Voluntary bodies	3	30
	Total	12	100

Table 3: Periodic Distribution of ARV Supply Chain Management Studies.

S/n	Period of study publication (year)	Number of Articles published n (%)
1.	< 2000	0 (0.0)
	2001-2010	2 (15.5)
2.	2011-2020	7 (67.5)
3.	2021-2022	2 (17.0)
4.	Total	11 (100.0)

Discussion

According to Iyeseun et al 2020, the global burden of HIV/AIDS is borne largely by Africa with South Africa and Nigeria ranking first and second. According to the ÙNAIDS, Nigeria recorded an HIV prevalence of 2.9% in 2016 with 3.2 million persons living with the virus. However, only 31% of these adults and 21% of the children were on antiretroviral therapy (ART). Many health facilities in Nigeria have their capacities overstretched with large numbers of persons accessing ART, increasing the burden on the limited resources available [2]. Nigeria has made remarkable progress in ARV supply chain management, but challenges remain. This study has identified key challenges such as inadequate data management and lack of coordination among stakeholders have hindered efforts to ensure uninterrupted access to ARVs for people living with HIV. While progress has been made in many areas, there is still room for improvement in the management of the ARV supply chain in Nigeria.

Overview of Supply Chain Management regarding medicine supply in Nigeria

Global ART supply chains in low and middle income countries (LMICs) are complicated, with multiple stress points and stakeholders that need to be successfully coordinated to ensure on-time delivery of ARVs to facilities and patients. Supply chain management encompasses the planning and management of multiple activities, including quantification and forecasting; procurement; importation and regulatory approval; delivery; proper storage at multiple intermediate points; and tracking and management of ARV stock levels and expiry. Importantly, it also includes coordination with donors, ARV manufacturers (and their suppliers), third-party providers and customers, John T et al 2011. The importance of supply chain management is widely acknowledged, however, access to quality essential medicines like ARVs in developing countries including Nigeria continues to be a challenge and these challenges continue to prevail due to increasing number of people living with the disease, poor policies and infrastructural development, amongst other factors as stated in the literature, Victory et al 2022 [2, 10]. To mitigate some of these challenges and improve the efficiency of medicines supply chains in Nigeria, some strategies have been implemented including the development of policies and programs such as the National Drug Policy, Nigeria Supply Chain Policy for Pharmaceuticals, National Drug Distribution Guidelines, regulation of human resources development, and engagement of professionals or personnel with relevant skills[1], Ogbonna BO 2016. Despite these strategies, the supply chain system in Nigeria remains weak and inefficient as there are still cases of stock outs of inventories in facilities, issuance of expired products to consumers/ patients by unqualified staff (during over the counter purchases at local patent stores) which is bred by low man power and unqualified or untrained personnel in the health system, delays in deliveries of supply to warehouses, health centers and hospitals.

Logistics Management Information System

A logistics management information system (LMIS) is a system of records

and reports – whether paper-based or electronic – used to aggregate, analyze, validate and display data (from all levels of the logistics system) that can be used to make logistics decisions and manage the supply chain[2], Lisa et al 2012. According to USAID on guidelines on managing HIV/AIDs supply chains in 2005, providing quality commodities and services could be considered the key interventions for HIV/AIDS commodity security, communications and education activities are also critical. Just to give one example, client education about ART is essential to ensure proper treatment adherence and optimal treatment outcomes. Otherwise drug resistance can emerge, and inconsistent demand can cause oversupplies or commodity stock outs. International Electro-technical Commission (IEC) is also one of the mainstays of HIV/AIDS prevention campaigns. IEC is not just about client, or patient, education. It includes providing information to caregivers, communicating to all stakeholders on their roles and responsibilities, advocating for resource mobilization, and so on. To ensure the necessary institutional and public support for the supply chain of HIV and ART commodities and for the provision of HIV and ART services, all stakeholders must understand and receive communication about the priorities and policies of national programs. Without this communication, stakeholders may be unable or unwilling to provide the supportive behavior necessary to enable the supply chain functions to operate smoothly.

Data and information are very important tools for building a resilient and effective medical supply chain management system. Quantification and Forecast for procurement of ARV drugs for a particular window relies on previous data collated [6]. Another study by USAID on the need for LMIS in 2006 stated that a West African country preparing to implement a national antiretroviral therapy (ART) program procured enough antiretroviral (ARV) drugs to treat 2,000 adults for two years. The calculation of estimated ARV drug needs was not based on realistic service capacity or utilization data but rather on the amount of funding available. Recent evidence suggests that the program may not have enough service sites or providers to enroll 2,000 patients in the ART program before the drugs expire. With no LMIS in place, tracking consumption patterns of the ARV drugs so that they can be distributed to high-volume sites will be difficult, and the risk of expiry or product mismanagement is high. Recognizing the potential negative impact for patients and the local and international publicity associated with wasting large quantities of these life-saving drugs, the program has prioritized the development of an LMIS [13]. The system will assist with optimal management of existing ARV drug supply and with providing realistic trends in future consumption, which can be used for preparing the next forecast and procurement plan. Meanwhile, the possibility of the Federal Ministry of Health to receive medicines supply from the manufacturers or suppliers in the right quantity, quality, price and time depends on how clearly information for an order was passed likewise what is to be distributed to regional warehouses and consumption sites. LMIS data elements include stock on hand, losses and adjustments, consumption, demand, issues, shipment status, and information about the cost of commodities managed in the system. Lack of collaboration among stakeholders in the Nigerian health sector is causing a major setback in the flow of reliable information which has also caused disruption in the medical supply chain and distribution of ARVs in the country.

Inventory Management, Warehousing and Distribution Practices

The study shows that these are very key components of supply chain management which must be taken into consideration when designing a reliable, resilient, responsive and transparent supply chain. Inventory control management plays a vital role in regulating inventory issuance and stock control by keeping records of frequency of demand for a particular product, rate of consumption to maintain safety stock level, and obsolesces due to over forecasting which can result in expiration of drugs or under usage of ARVs as a result of non compliance from the victims due to stigmatization, system reaction and other logistics issues. Warehousing which on the other hand serves as a safe house or facility for storage must be properly designed to fit it purpose. A warehouse where antiretroviral drugs are stored has to be equipped with functioning refrigerators for temperature regulated vaccines and lightening to reduce the accident rates in the warehouse. Warehouse design needs to be up-to-date and in line with international best practices, trained staff and personnel have to ensure that FIFO FEFO procedures are adhered to in order to minimize drugs expiration rates. Distribution planning or management in Nigeria is a very complex phase of supply chain management especially when it concerns cold chain or temperature regulated drugs or vaccines. This is influenced by logistical challenges associated with poor infrastructural development on our road transport system which makes it a lot more difficult for patients in rural areas to have access to ARVs. Insecurity is also a factor that affects distribution of ARVs to most parts of the country especially the northern parts due to banditry which have made the roads unsafe for long hauls shipment that require moving at night to meet up schedules and uncertainties.

Collaboration amongst Stakeholders for ARV Supply Chain Management in Nigeria

Results shows that NGOs, government agencies and ministries, Voluntary bodies like individuals and private sector are the drivers of ARV drugs supply chain management in Nigeria. Supply chain management of heath commodities in Nigeria is faced with complexity as in involves various stakeholders ranging government agencies and ministries to religious groups, private sectors as well as non government organizations, all with different interests. Lack of collaboration amongst these stakeholders has done more harm than good to the development and implementation of drug supplies policies to affected places and health facilities. Government agencies needs to take action by providing a budget for funding health programs especially the HIV/AIDS programs that's eating deep to our population at an increasing rate to those in their productive age, other than relying on NGOs for full funding rather than support. Religious groups can do better in sensitization of the general public instead of stigmatizing the victims by denying them entrance to places of worship and keeping them in isolation without socializing because of their conflicting beliefs. Private sectors must continue to collaborate with the government by carrying out corporate social responsibility projects to aid the affected victims gain access to ARV vaccines. A lot of facilities are left underdeveloped and underutilized due to the lack of collaboration amongst stakeholders.

Conclusion

The review of literature on antiretroviral drugs supply chain management in Nigeria highlights the significant progress made in ensuring availability and accessibility of ARVs in the country. However, the study also identifies several sustainable supply chain management challenges that have the potential to undermine progress made so far. The identification of these challenges is important for policymakers and the healthcare sector to develop effective strategies to mitigate barriers to the availability and accessibility of ARVs.

Study Limitation

There is possibility that I might have missed relevant articles or publications that would have contributed to the data and body of knowledge due to partial search.

Conflict

The authors have none to declare.

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Cite this article: Obadiah Ejem Enemushie, Ogbonna Chigozie A, Ogudu Friday O, Umeh Ifeoma B, Nnamani Monica N, Anetoh Maureen U, Ogbonna Brian O. (2026) ANTIRETROVIRAL DRUGS SUPPLY CHAIN MANAGEMENT IN NIGERIA: A NARRATIVE REVIEW. Japan Journal of Medical Science 7 (2): 383-389.