DEVELOPMENT OF CONCEPTUAL FRAMEWORK FOR HOUSEHOLD MEDICINE DISPOSAL PRACTICES IN INDIA AND ITS IMPACT ON ENVIRONMENT

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ABSTRACT

Reverse logistics refers to managing a supply chain in reverse direction from the consumers to the manufacturers. Reverse logistics is the part of supply chain management practice that flow of products and information from the customers to the manufacturers for the purpose of value recapture and proper disposal. It becomes more challenging, mainly, in the background of supply chains of perishable products. The pharmaceutical medicines are time perishable which plays an important role in order to cure, prevent and diagnose human disease and keep people healthy. It is important issue that the disposal of pharmaceutical medicines to the environment and it requires special handling to dispose. Pharmaceutical medicine waste is a form of medical waste that includes unused or expired household medications. This study is performed by using secondary data collection method as review of various literatures. In this study we discussed various disposal practices of unwanted or expired household pharmaceutical medicines and proposed a conceptual framework model about disposal practices, type of medicines and amount of impacts.

KEYWORDS: Reverse logistics practices, Disposal practices, Environmental hazards, Household Medicines.
INTRODUCTION
Reverse logistics is defined as “all activities associated with a product/service after the point of sale, the ultimate goal to optimize or make more efficient aftermarket activity, thus saving money and environmental resources” Reverse Logistics Association, (2009). According to Rogers D.S and R.S.Tibben-Lembke, (1998) reverse logistics is defined as the process of planning, implementing, and controlling the efficient, cost effective flow of raw materials, in-process inventory, finished goods and related information from the point of consumption to the point of origin for the purpose of recreate value or proper disposal”. Ritchie et al, (2000) discussed the reverse logistics functions of hospitals. They mentioned three activities of reverse logistics namely recycle, reuse, and disposal which can be applied on the basis of the reliability of medicines. The main purpose of reverse logistics is to reduce the handling cost while increasing the value from the goods, or proper disposal.

REVERSE LOGISTICS IN PHARMACEUTICAL INDUSTRY
Reverse logistics in the pharmaceutical industry is particularly important from the economic, environmental as well as regulatory point of view. Malik Iqbal Kabir, (2013) defined reverse logistics as process of handling of products back to manufacturers or producers end. Haidar Abbas and Jamal AFarooquie (2013) discussed that Reverse logistics practices in pharmaceutical industry as four practices. That are donation, disposition, store, return and the disposal practices of unwanted medicines are throw (Threw them into the trash), flush (Flushed down into the toilets or sink), bury (Dumped in environment) and burn (Incineration)

Fig. 1 Disposal Process of Pharmaceutical Medicines
Several important considerations for the industry when it comes to reverse logistics are the safekeeping of the returned goods, maintaining the cost low with the assist of computerization, traceability of the goods returned from the customer to the final point of disposition.

**Indian Brand Equity Foundation** stated that the Indian pharmaceuticals market is the 3rd largest in terms of volume and 13th largest in terms of value in the world. The Indian pharmaceuticals market increased at a Compound Annual Growth Rate (CAGR) of 17.46% in 2015 from US$ 6 billion in 2005 and is expected to expand at a CAGR of 15.92 per cent to US$ 55 billion by 2020. By 2020, India is likely to be among the top three pharmaceutical markets by incremental growth and 6th largest market globally in absolute size.[1]

**Manal El-Hamamsy (2011)** People may not use all the medications provided to them due to side effect, treatment changes, withdrew the medication, or medicines reached the expiration date. Therefore, it is not unusual for patients to be in possession of unused or expired medications. **Alfred YC Tong et al (2011)** had given a review of pharmaceuticals have been widely identified in the environment and in a few cases can lead to harmful effects on natural world.

**Entry paths of pharmaceuticals into environment (Source: Helene Morissette2006)**

![Diagram](source)

**Fig. 2 Entry paths of pharmaceuticals into environment**

Disposal practices or metabolic excretion of humans can be the reason for the entry path of pharmaceutical medicines into the environment. The drinking water is ultimately affected by
the transformation of pharmaceutical medicines through landfills and water bodies. It can cause huge impact on human life. So, it is very essential to minimize the disposal of medicines which affects the environment.

LITERATURE REVIEW

Reverse Logistics Journals

Marisa P. de Brito and Rommert Dekker, (2003) discussed with the variables: Driving forces and return reasons, what types of products are streaming back, how they are being recovered, and who is executing and managing the various operations.


Arvind Jayant, P. Gupta and S. K. Garg, (2011) performed case study approach to identify the problem. This study covers study of the complete supply chain and to analyze the future performance of the reverse logistics network and to understand the complex relationship between the parties involved in reverse logistics operation.

Kuan Siew Khor and Zulkifli Mohamed Udin, (2012) analysed various literature reviews about the product disposition and bring out the research framework as Reverse Logistics product disposition with business performances of E&E companies in Malaysia.


Mohamad Tabikh, (2013) in his paper analysed various journals of P&OM field and gives out the research characteristics on reverse logistics in the methodology of secondary data (online journals). This paper used to classify the research topic, analyze the methodologies and tools for research.

Sergio Rubio and Beatriz Jiménez-Parra, (2014) gives out the concepts of reverse logistics and its implications for supply chain management. The decisions regarding Reverse logistics implementation based on three activities as collection of eou products, inspection and classification and recovery process.
(Isabel Fernández and Beatriz Junquera) discussed the case analysis about the relationship between repair activities, reverse logistics and sustainable development. By the methodology of secondary data in that comparative analysis was conducted and gives out definite assumptions for case analysis.

S. Senthil, R.Sridharan, (2014) discussed the various published journal about Reverse Logistics for the researchers and gives out integrating product recovery into the network design poses a major challenge in any industry. Gowri Vijayan et al, (2014) introduced a framework that adoption level of RL and firmographic characteristics with the variables like environment concern, firmographic characters, Barriers to adoption.

Researcher conducted this study with the review of various literatures to investigate the implementation of RL for remanufacturing strategy in Caterpillar: manufacturing sector and its impact on customer satisfaction levels Ahmed Gamal Mohamed et al, (2015).

Kannan Govindhan et al, (2015) give out comprehensive review of scientific journals that related to reverse logistics and closed loop supply chain. The authors categorized the recently published papers with the suggestion of future opportunities of Reverse Logistics.

Pharmaceuticals Journals

Vika Lutui, (2001) discussed the Tongan waste management tends to impact on environment. They suggest the waste management practices with regulated policies, waste minimization initiatives.

Helene Morissette, (2006) gives out the project report highlighted a variety of issue associated with the current process of disposal of unused drugs.

Wan-hih Tom, (2007) gives out an article about federal disposal guidelines to the medicines which can be disposed throw trash and flushed down in toilets.

Asma Khan and Masood Subzwari, (2009) described the Reverse Logistics practices in pharmaceutical industries in Pakistan as the reverse logistics (RL) process management can
improve the efficiency of overall supply chain with the variables: Medicines return, Inventory management through RFID.

Shailendra Kumar Mandal and Joydeep Dutta, (2009) discussed the solid waste management plan for Patna city. A model is proposed by authors for the solid waste management (bio medical) to the institute of town planners.


Liz Breen et al, (2010) discussed the issue of how to reduce the volume of waste medicine by creating a framework with Customer advice and support, customer relationship management, product management, effective inventory management and drivers of customer compliance.

Ying Xie, Liz Breen, (2010) Approach: Cross boundary green pharmaceutical supply chain resulted in fewer preventable medication waste and more recycling of inevitable medication waste, therefore improved environmental, economic and safety performances.

Alfred YC Tong et al, (2011) discussed the valid disposal practices is returning the medicines to the pharmacies will reduce the environmental issues. Suggested that a need for increased environmental awareness amongst community pharmacists in New Zealand.

Manal El-Hamamsy, (2011) conducted this study to knew about the disposal methods of unused medicine, returned medicines to pharmacies and how cost in Cairo, Egypt with the variables: classified drugs from pharmacies, disposal methods.

Ana Margarida Santos Bravo, José Crespo de Carvalho, (2012) performed this study with the goal was to merge finding from previous work developed by the authors in areas like pharmaceutical recalls, retains and sustainable practices, challenges that the industry is facing not only to be accounted as responsible.

Md. Abul Kalam Azad et al, (2012) conducted this study with the aim that create awareness among the effect of environment by medicine wastes and suggested that to develop of public awareness and there is also need to develop dispensing policies & delivered to collection bag which deduction the volume of medication waste.
Sushmita Narayana Aghalaya et al, (2012) analysed the difficulties affecting the reverse logistics processes in the Indian pharmaceutical industry.

Gupta Dharmendar et al, (2013) conducted this study to explore opinion and practice toward unused medication disposal with the variables of type of disease and medications, disposal method.

Radhakrishna Lagishetty et al, (2013) conducted this study to evaluate the practice towards disposal of medicines. They analysed the disposal methods with that recommended Physicians, Pharmacists have to create awareness to the patients of environmental issue.

Suruchi Aditya, (2013) aimed to explore the knowledge, attitude, beliefs about drug wastage and methods to dispose unused and leftover medications at home with the variables: Disposal methods, Demographic variables.

Malik Iqbal Kabir, (2013) discussed the perception of those industry practices on the environment and sustainability practiced by organizations has shown less enthusiasm than once thought.


Innocent A. Jereme et al, (2013) discussed the issues of incineration disposal method of waste management with objective to reiterate that incineration is not a sustainable waste management system.

Haidar Abbas and Jamal A Farooquie, (2013) discussed the logistics practice of pharmaceutical operations with return and disposal practices as throw, flush, bury, burn and return management.

Asante OB et al, (2014) found out the practices of healthcare waste management and its impact, they analysed the health care policies of Ghana and enforces the local government to improve the current situation and to protect the environment and human health.

Tadele Atinafu et al, (2014) described the main objective of this paper was to assess unused medications disposal practice of patients of university with the variables: Demographic, Reason for disposal.

Kwame Owusu Kwateng et al, (2014) revealed a gap in the flow of reverse logistic activities; from drug returns to its disposal and gives out efficient method for drug disposal by pharmaceutical manufacturing companies in Ghana.

Dua Weraikat et al, (2015) gives out the pharmaceutical reverse supply chain aimed to reduce the disposal of medicine by recycling the waste.

Need For the Study
With increasing world population today, there is a huge need to manage the community facilities including solid waste collection and disposal. Within the area of pharmaceutical waste, disposal of medicines acquires a special dimension, since it is infectious and environmental hazardous. It is capable of dispersing syndrome or be harmful to individuals. So the purpose of study is about the disposal practices of unwanted medicines and to find out its impact on environment.

METHODOLOGY
This paper considered various journal papers to get the conceptual framework about pharmaceutical waste in household. By using secondary data collection method, we reviewed various journals and proposed a model for methods of disposal practices, types of medicines and amount of environmental impacts.
PROPOSED MODEL

![Fig.3 Proposed Model](image)

DISCUSSION AND CONCLUSION

This paper presents a review of literature in reverse logistics. The review has been made on around forty papers considering the reverse logistics practices and disposal of pharmaceutical medicines. Disposal practice of unused or expired medicines varies from country to country. In India, the awareness about the disposal practices of household medicines is very low. So, it may be a big issue for the environment. In some papers, many authors discussed about the environmental impacts of various disposal practices but, in India there is no specific study conducted about the household pharmaceutical disposal practices and its impacts on environment. This study is an attempt to fill this research gap. After a comprehensive literature review in the context of Pharmaceutical industry, the disposal practices can be found and proposed a model about the disposal practices, type of medicines and amount of impacts. The impacts of environment can find by collecting real time data from leading experts and physicians from various cities in India.

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