

A STUDY ON COLD CHAIN LOGISTICS AT PLEXMARINE LOGISTICS, CHENNAI

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ABSTRACT

This article highlights the concept of cold chain logistics, the importance of cold chain logistics and the role and benefits of A cold chain is a monitored temperature-controlled supply chain. The goal of the cold chain is to keep a sample or material within a certain temperature range during all stages of delivery, processing and storage. Cold chains are widely used to ensure the viability of products in the pharmaceutical and agricultural sectors, and are critical components of vaccination programs and bio-medical surveillance activities.

Keyword: Cold Chain Logistics; Implementation Challenges; PLEXMARINE LOGISTICS, CHENNAI

1.1 INTRODUCTION

A cold chain is a monitored temperature-controlled supply chain. The goal of the cold chain is to keep a sample or material within a certain temperature range during all stages of delivery, processing and storage. Cold chains are widely used to ensure the viability of products in the pharmaceutical and agricultural sectors, and are critical components of vaccination programs and bio-medical surveillance activities. Many biological samples deteriorate when exposed to heat, sunlight, or fluorescent light. When transporting and storing such biological substances, it is imperative that field and laboratory teams control environmental conditions, ensuring that exposure to potentially damaging environmental factors is minimized.

The cold storage, handling, and distribution of temperature-sensitive drugs represent an increasingly important component of the global pharmaceutical supply chain. Clinical trial material (CTM) or investigational medicinal products (IMP) are an important part of the earliest stages of the life science supply chain. Given the increased number of global regulatory and standards-based guidance documents issued over

the past two years, members of the pharmaceutical supply chain are taking notice and making changes to ensure product quality and protect patient safety. The purpose of this paper is to review the various factors affecting Good Cold Chain Management Practices for Clinical Trial Materials/Investigational Medicinal Products.

Cold Chain is a system of storing and transporting vaccine at the recommended temperature range from the point of manufacture to point of use. In order to provide potent and effective vaccine to the beneficiaries a vast cold chain infrastructure is required, which should have a network of Vaccine Stores, Walk-in-coolers (WIC), Walk-in-freezers (WIF), Deep Freezers (DF), Ice lined Refrigerators (ILR), Refrigerated trucks, Vaccine vans, Cold boxes, Vaccine carriers and icepacks from national level to states up to the out reach sessions. The cold chain system and vaccine flow in the country, The vaccines are transported from the manufacturer under the temperature range of 2-8°C.

1.2 REVIEW OF LITERATURE

Researcher Name: Celina M. Hanson (Researched in 2018)

Vaccine exposure to temperatures below recommended ranges in the cold chain may decrease vaccine potency of freeze-sensitive vaccines leading to a loss of vaccine in cold chain supply logistics. Analyzing the prevalence of vaccine exposure to temperatures below recommendations throughout various segments of the cold chain supply. Overall, 45 studies included in this review assess temperature monitoring, of which 29 specifically assess 'too cold' temperatures.

Conclusion:

This review highlights continuing issues of vaccine exposure to temperatures below recommended ranges during various segments of the cold chain. Studies monitoring the number of events vaccines are exposed to 'too cold' temperatures as well as the duration of these events are needed. Many reviewed studies emphasize the lack of knowledge of health workers regarding freeze damage of vaccines and how this has an effect on temperature monitoring. It is important to address this issue by educating vaccinators and cold chain staff to improve temperature maintenance and cold chain supply management.

John Lloyd (Researched in 2018)

Freezing of vaccines is a growing threat and a real risk for national immunization programs when the potency of many vaccines can be compromised if these are exposed to sub-zero temperatures in the cold chain supply logistics. This issue is compounded by using sub-standard domestic cold chain equipment instead of equipping the program with medical refrigerators designed specifically for storing vaccines and temperature sensitive pharmaceuticals.

Conclusion:

Review highlights, Risk of freezing in storage reduced in reviewing the findings from the baseline assessment of temperature metrics, temperature monitoring solution was implemented in Tunisia and successfully demonstrated that the use of electronic/continuous temperature monitoring and freeze prevention technologies can help significantly to reduce the incidence of inadvertent freezing of vaccine. Continuous monitoring of storage temperatures detected temperature excursions and freeze even when health workers were not present. In addition, the ability to analyze the temperature data in real time allowed health workers to take corrective action and specific standard operating procedures were put in place to help health workers respond appropriately.

Patrick Lydon (researched in 2017)

Vaccine availability is interrupted for any reason, missed opportunities to vaccinate will occur and populations run the risk of not being protected against deadly preventable diseases. Recent evidence has shed light on the fact that vaccine supply chain systems have gradually outgrown their ability to ensure uninterrupted availability of vaccine and to manage this current Decade of Vaccine priorities and commitments as delineated in the Global Vaccine Action Plan (GVAP 2011–2020)

Conclusion:

As the findings revealed, essential vaccines are not always available when needed and stockouts occur on a regular basis at both national and subnational levels. Countries in all regions of the world and of all income groups experience regular stockouts of key vaccines, and in many cases these cause an interruption of immunization services. Results from an immunization coverage analysis in 17 countries that reported stockouts at all levels of the system and interruptions in vaccination services suggest that stockouts can potentially reduce DTP3 coverage by 7–10% points [9]. In the Philippines for instance, repeated stockouts of DTP-Hep B-Hib vaccines is estimated to have contributed to a 15% point reduction in the

national coverage estimate [10]. Given the size of the population in the Philippines, large segments became unprotected.

Steve McCarney (Researched in 2016)

Maintaining the vaccine supply chain from manufacturer to population in need is vital for the success of immunization programmes and requires highly efficient systems and technologies to be sustained, especially in resource-challenged areas. The process requires that vaccines are kept cool in a cold chain at all times during storage and transport from the national warehouse up to remote health centres. High performing and efficient distribution, combined with rigorous vaccine handling are already critical success factors in the best existing systems of distribution. Electric utility vehicles, dedicated to the integrated delivery of vaccines and medicines, improved the regularity and reliability of the cold supply chains.

Conclusion:

The scheduling of fixed delivery circuits for vaccines and medicines minimized the distances travelled by the electric vehicles and avoided costly 'emergency' journeys to collect vaccine. There were also benefits from integrating storage and distribution of vaccines and medicines [15]. The best general indicator of the improved efficiency of the distribution system achieved during the project interventions including the use of dedicated electric vehicles was the improvement of performance of the vaccine in distributing the vaccines to the distributor using the cold chain supply logistics.

1.3 OBJECTIVES OF THE STUDY

PRIMARY OBJECTIVE

The general objective of this study was to establish the influence of cold chain supply logistics on safety of vaccines with special reference to Plexmarine Logistics Pvt Ltd

SECONDARY OBJECTIVES

- To determine how storage conditions in pharmaceutical distributors influence safety of vaccines.
- To determine the influence of transport systems on the safety of vaccines in pharmaceutical distributors.
- To evaluate the influence of packaging in pharmaceutical distributors on the safety of vaccines.
- To establish the extent to which technical capacity in pharmaceutical distributors influence safety of vaccines.

1.4 SCOPE OF THE STUDY

The major scope of the analysis on cold chain logistics in pharmaceuticals are

- a. To increase the longevity of the medical characteristics
- b. Maintain the temperature level for the vaccines
- c. Retain the nutritional value of vaccines
- d. Maintain the chemical substance of vaccines
- e. Reduce wastage and return of expired stock of vaccines

1.5 STATEMENT OF THE PROBLEM

“Problem statement is a statement in which focusing on some activities in the company where the improvement is needed, There is more to research on cold chain logistics.”

In problem statement, currently problem must be exists in the company and the management should need to improve in their activities of transport and safety of the product. The problem statement is generalised in that more source of uncertainty in problem can be considered,

It Includes:

- What is the processing time of the products?
- What are the resource requirements for logistics?

- How much the success probabilities?
- Safety of the products that under taken by distributors?
- Whether the material may lead damaged?
- Tracking of products while shipment?
- What is the common temperature range for a cold chain logistics?

1.6 RESEARCH METHODOLOGY

DESCRIPTIVE RESEARCH

The researcher had gone descriptive research for studying the attitude of the employees. A sample descriptive research design is used when data are collected to describe persons, organization, settings or phenomena

SAMPLING DESIGN

Sample design is the theoretical basis and the practice means by generalizing from characteristics of relatively few of the comprising population. It is the method by which the sample is chosen.

RESEARCH INSTRUMENT

The research instrument used in this study is Questionnaire.

AREA OF STUDY

The study was conducted at PLEXMARINE LOGISTICS, CHENNAI.

STATISTICS TOOLS

The statistical tools used for analyzing the data collected are

1. Reliability analysis.
2. Percentage method.
3. Chi-square.
4. ANOVA.

1.7 DATA ANALYSIS AND INTERPRETATION:

RELIABILITY TEST STATISTICS

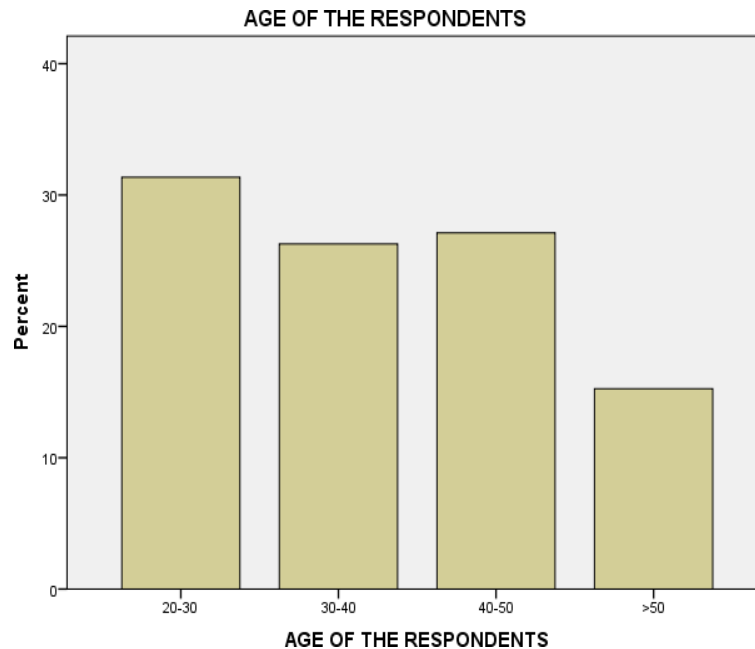
Cronbach's Alpha ^a	N of Items
.783	19

INTERPRETATION:

Cronbach's alpha value of all the 19 items are, $\alpha = 0.783$, this value is acceptable, It clearly shows that, all the 19 items will be reliable and internally consistent.

AGE OF THE RESPONDENTS

Description	No of Respondents	% of Respondents
20-30	37	31.0
30-40	31	26.0
40-50	32	28.0
>50	18	15.0
Total	118	100.0



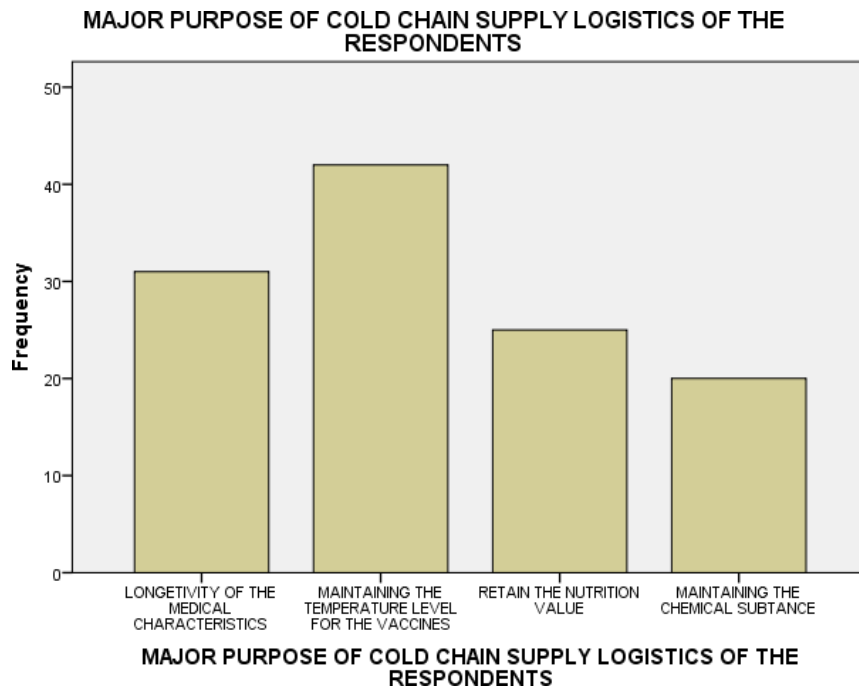
INTERPRETATION:

From the above it is interpreted that 31% of the respondents are belongs to age between 20-30, 28% of the respondents are belongs to age between 40-50, 26% of the respondents are belongs to age between 30-40, 15% of the respondents are belongs to age above 50.

Therefore 31% of the respondents are belongs to age between 20-30.

MAJOR PURPOSE OF COLD CHAIN SUPPLY LOGISTICS OF THE RESPONDENTS

Descriptions	No. of Respondents	% of Respondents
Longevity of the medical characteristics	30	25%
Maintain the temperature level for the vaccines	41	35%
Retain the nutritional value	25	21%
Maintain the chemical substance	22	19%
Total	118	100%



INTERPRETATION:

From above table it interpreted 35% of the respondents mentioned that Maintaining the temperature level for the vaccines, 25% of the respondents mentioned that longevity of the medical characteristics, 21% of the respondents mentioned that retaining the nutritional value, 19% of the respondents mentioned that maintaining the chemical substance.

Therefore 35% of the respondents mention that Maintaining the temperature level for the vaccines.

ANOVA

TRANSPORT SYSTEM INFLUENCE THE SAFETY OF VACCINES IN DISTRIBUTOR OF THE RESPONDENTS

Descriptions	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	7.938	4	1.984	1.279	.283
Within Groups	175.350	113	1.552		
Total	183.288	117			

INTERPRETATION:

H₀- There is a significance difference between the Transport systems influence the safety of vaccines in distributors and the packaging has a big influence in distributors on the safety of vaccines.

H₁- There is a no significance difference between the Transport systems influence the safety of vaccines in pharmaceutical distributors and the packaging has a big influence in pharmaceutical distributors on the safety of vaccines.

RESULT:

p Value = 0.283 > 0.05 Hence Null hypothesis I accepted. Therefore there is no significant different between the Transport systems influence the safety of vaccines in pharmaceutical distributors and the packaging has a big influence in pharmaceutical distributors on the safety of vaccines.

TABLE NO: 4.2.2 CHI-SQUARE TEST

Descriptions	Income of the Respondents	Experience of the respondents
Chi-Square	44.119 ^a	50.390 ^a
Df	4	4
Asymp. Sig.	.000	.000

INTERPRETATIONS:

Ho- There is a relationship between the Experience of the respondents and Income of the respondents.

H1- There is no relationship between the Experience of the respondents and Income of the respondents.

Result:

ρ Value = 0.000 < 0.05 Hence Alternate ρ hypothesis is Accepted. Therefore there is relationship between the Experience of the respondents and Income of the respondents

RESULT AND DISCUSSION

MAIN FINDINGS:

- 31% of the respondents are belongs to age between 20-30.
- 71% of the respondents are male.
- 31% of the respondents are Graduate.
- 44% of the respondents have between 1-3year.
- 41% of the respondents income range between Rs 20000-30000.
- 35% of the respondents mention that the major purpose of cold chain supply logistics happens by Maintaining the temperature level for the vaccines.
- 31% of the respondents say that the main objective of cold chain supply logistics in cold chain industry is to increase the customer satisfaction.

OTHER FINDINGS:

- Cronbach's alpha value of all the 14 times are, $\alpha = 0.783$, this value is acceptable, It clearly shows that, all the 14 items will be reliable and internally consistent.
- ρ Value = $0.283 > 0.05$ Hence Null hypothesis I accepted. Therefore there is no significant different between the Transport systems influence the safety of vaccines in pharmaceutical distributors and the packaging has a big influence in pharmaceutical distributors on the safety of vaccines.

ρ Value = $0.000 < 0.05$ Hence Alternate ρ hypothesis is Accepted. Therefore there is relationship between the Experience of the respondents and Income of the respondents

SUGGESTIONS

1. PlexMarine Logistics Pvt Ltd has to improve their planning for emergencies
2. Necessary measures need to be taken for maintenance and cold chain rehabilitation
3. Frequent breakdowns in cold chain has be avoided to improve the overall efficiency of cold chain logistics in handling products.
4. Frequent rise in forwarding cost can be avoided by owning the cold chain transportation and the cold storage.
5. Incorrect use of the Vaccines Vial Monitor (VVM) as a management tool has be avoided. Proper process has to be followed during the overall cold chain logistics for vaccines.

CONCLUSION

Cold chains are common in the food and pharmaceutical industries and also in some chemical shipments. There have been numerous events where vaccines have been shipped to thirdworld countries with little to no cold chain infrastructure (Sub-Sahara Africa) where the vaccines were inactivated due to excess exposure to heat.

This study has been undertaken to assess the feasibility in handling the products like vaccines in cold chain logistics with special reference to Plexmarine Logistics Pvt Ltd. For this purpose, responses from the members involved in cold chain logistics have been collected and analyzed. Based upon the findings out of the research few valuable suggestions like proper use of Vaccines Vial Monitor (VVM) as a management tool, processing time of the products is dependent on the destination from the place of begin and capability of the products, resource required for the cold chain logistics are such as Dry ice, Liquid nitrogen, Gel packs, Eutectic plates, Quilts, Reefers, No products damaged while on supply chain, PlexMarine enable the customer to track their product shipment through internet to know the status of the product shipment, common temperature range for vaccine is 2-8 °C and improve the planning for emergencies are admitted by Plexmarine Logistics Pvt Ltd. The overall performance and functions helps to maintain the goodwill towards their company. These research will pave way for improving the overall efficiency of the cold chainlogistics

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