

Demand Dynamics of Bangladeshi Plastic Products: A Case on Pharmaceutical Primary Packaging Materials

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Abstract

Pharmaceutical packaging is highly sophisticated since quality and safety issues are the utmost priority. However, use of high class plastic products for pharmaceutical packaging is very common and it is increasing day by day. The important plastics which find large packaging applications are High Density Polyethylene (HDP), Polypropylene (PE), Poly Vinyl Chloride (PVC), Polyvinylidene chloride (PVDC), Polyester, Polystyrene etc. These are used for building the body structure of the packages, while other polymers are often used in less thickness as coating to improve the functional properties of basic packaging. Presently Bangladeshi pharmaceutical companies are using all these plastic materials for packaging purposes collected from both local and global sources. The local pharmaceuticals plastic packaging materials producers are capturing almost 70% of the local market and rest 30% are import dependent where technology is very high. Nevertheless, some local plastic companies are setting up world-class dedicated plant for pharmaceutical plastic packaging and some pharmaceutical companies like Square and Acme itself extending their facility to produce plastic packaging materials. Therefore, this study will identify the demand dynamics of plastic packaging materials of Bangladeshi pharmaceuticals.

Keywords: Pharmaceuticals; Packaging; Plastic; Demand dynamics

Introduction

Working definition of pharmaceutical primary packaging

Primary packaging means any single part of a container closure system. Typically, containers, container liners, screw caps, stoppers, closure liners, stopper over seals, container inner seals, administration on large volume parenterals, overwraps, administration accessories and container labels. In this study a primary packaging component means a packaging component or its direct extension that comes in direct contact with the dosage form.

Broad objectives

- To identify the demand dynamics of plastic packaging products by Bangladeshi pharmaceutical companies.

Specific objectives

- To identify the type of commonly use plastic packaging materials for pharmaceuticals
- To identify the market size of plastic packaging materials for pharmaceuticals
- To identify the technical specialty for supplying plastic packaging materials for pharmaceuticals
- To identify the underlying causes of importing plastic packaging for pharmaceuticals
- To identify the future prospects of plastic packaging for pharmaceuticals

Methodology

Type of study

This is a qualitative exploratory research where both primary and secondary data has been used.

Primary data source

For primary data, an open-ended questioner was developed and

respondents were interviewed with it to get the answers.

Secondary data source

For secondary data, we mostly relied on different journals, reference books, articles and various reputed websites.

Sample selection

Since it is a small-scale study; so, we interviewed the Commercial/ Supply Chain Managers of top 10 pharmaceutical companies (by value) since they are responsible for the demand management of plastic packaging materials. It is worth mentioning that top 10 companies represent more than 69% of total pharmaceutical market of Bangladesh (IMS, 3Q, 16).

We have also interviewed 05 experts with some open-ended questioner most of them are either owner or association leader of plastic sector of Bangladesh. This was done to get more insight about the entire industry.

To get further imminent, we interviewed Supply Chain Manager of a multinational pharmaceutical company who are operating in Bangladesh but out of top 10 ranking. This was done because there is a perception that multinationals are very cautious about quality standard and maintain global average.

Data analysis

Since the study will be qualitative and the answer will be open

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ended; so, we have just compiled the data and no special statistical analysis was done.

Literature Review

Demand dynamics

Demand is the relationship between the quantities of a good or service consumers will purchase and the price charged for that good. The law of demand states that the quantity demanded for a good rises as the price falls, with all other things staying the same. The 'all other things staying the same' part is important. There are other things that can affect demand besides price. They are prices of related goods or services, income, tastes or preferences and expectations. (Aaron Hill, 2003). *From the expert opinion, in case of plastic pharmaceutical packaging materials, quality becomes the key driving factor along with price since they are highly sensitive.*

At a glance plastic industry of Bangladesh

Plastic is an engineered material used to manufacture a wide variety of products to meet the domestic demand in Bangladesh as well as some products are exported. The plastic industry has emerged as an important industrial sector in the country during the last two decades. At present, there are 3,000 plastic manufacturing units, 98% of which belong to the Small-Medium Enterprises (SMEs). Domestic market size is Tk 7000 crore. Per capita consumption of plastics in Bangladesh is 5 kg per year. The plastic sector constitutes 1% of GDP and provides employment for half a million people [1-3].

Purpose of using plastic packaging materials in pharmaceuticals

Purpose of using plastic packaging materials in pharmaceuticals include physical and chemical stability of the medicine (being an effective barrier to light, moisture, oxygen, bacteria, volatiles, etc. as appropriate), mechanical trauma-protection from damage, during transit, distribution and storage of the product, maintaining product integrity until its in-use phase is completed or the expiry date stated on the label has passed [4].

History of using Bangladeshi pharmaceutical packaging

From history, it is known that the story of using Bangladeshi plastic pharmaceutical packaging started in 1978. Among the old companies, Siddique Plastic and Luna Plastic were supplying plastic bottles to Reyman Drugs, Pfizer Bangladesh, Squibb Laboratories and Gaco Pharmaceuticals. Thereafter, many other companies like Bengal Plastic, Islam Plastic, National Polymer, Padma Plastic, Polycon, Asia Plastic, Bismillah Plastic etc. also become engaged in supplying plastic packaging for local pharmaceutical companies. Now a day's more than 30 local companies are supplying PET bottle, Spoon, Measuring Cup, Dropper, Nozzle etc. to almost all the local companies. Also, some plastic products manufacturing companies have dedicated manufacturing plants for pharmaceutical packaging (Table 1) [1].

Plastics uses in pharmaceutical packaging

Polyethylene (PE): Provides good barrier against moisture, relatively poor one against oxygen and other gases. High density polyethylene is used with density ranging from 0.91-0.96 leading to four basic characteristics of container, (1) Stiffness, (2) Moisture-vapor transmission, (3) stress cracking and (4) clarity or translucency based on polymer density used.

Polypropylene (PP): Polypropylene has features of polyethylene

Year	Technology and Products
1960	Small products such as toys, bangles and photo frame were made using handmade mold
1970	Automatic machines were installed to manufacture household utensils such as plastic jugs and plate
1980	Film blowing machines to manufacture plastic bags
1991	Plastic accessories especially hangers for exportable garments
2000	Moulded plastic chairs and tables. Water tank made by rotation moulding. Locally developed machines (shredder, Extruder, Pelletizer) for recycling plastic waste
2010	CNC machines are imported by Bangladesh to manufacture the mould locally

Table 1: Development history of plastic industry of Bangladesh [1].

in addition it does not stress-crack in any condition. Hot aromatic or halogenated solvents soften the package. It has high melting point making it suitable for boilable packages and products needed to be sterilized. Brittleness at low temperature is its major disadvantages.

Polyvinyl Chloride (PVC): Can be produced with crystal clear clarity, will provide good gaseous barrier and stiffness. Reduction in residual vinyl chloride monomers had further enhanced PVC quality. PVC is used as coating on glass bottles providing shatter resistant coating.

Polyvinylidene chloride (PVDC): It is a remarkable barrier against water, oxygen and aromas. It has a superior chemical resistance to alkalis and acids, is insoluble in oil and organic solvents, has very low moisture regain and is impervious to mold, bacteria, and insects. But it is soluble in polar solvents.

Polystyrene: Rigid and crystal clear plastic. Not useful for liquid products. Polystyrene has high water and gaseous permeability also these are easily stretchable and breakable. To increase their strength and quality for permeability polystyrene is combined with rubber and acrylic compounds. Base on the composition these are classified as intermediate impact, high impact and super impact packages.

Nylon (polyamide): Many dibasic acids and amines combine to provide numerous varieties of nylon. Nylon is extremely strong and is quite difficult to be destroyed by mechanical means. Nylon provides resistance to wide range of acids and alkali only disadvantage of it is being permeable to water vapor for some amount this can also be dealt with coating of PE over the container. Not used for long term storage of products.

Polycarbonate: Has an ability to be sterilized repeatedly. It has immense rigidity and is a possible replacement for glass, vials and syringes. It has qualities like high dimensional stability, high impact strength, resistance to strain, low water absorption, transparency, and resistance to heat and flame. Polycarbonates have impact strength five times greater than any other common packaging plastics.

Acrylic multipolymers (Nitrile Polymers): These are polymers of acrylonitrile or methacrylonitrile monomers. These provide for packaging of those products which are not packed in usual packages as they provide for high gas barrier, good chemical resistance, and good strength.

Polyethylene terephthalate (PET): Condensation polymer formed by reaction of terephthalic acid or dimethyl terephthalic acid with ethylene glycol. It has excellent strength and provides barrier for gas and aroma making it as a useful package for cosmetics, mouth washes and other products [5].

Key issues in selecting pharmaceutical packaging

Plastic packaging systems for pharmaceutical products must be suitable for their intended use. That is, the packaging system should adequately protect the pharmaceutical product, should be compatible with the pharmaceutical product, and should be composed of materials that are safe for use. From a chemical perspective, plastic packaging systems used in pharmaceutical applications should be such that the ingredients of the pharmaceutical product are not adsorbed onto the surface of the packaging system, are not absorbed into the body of the packaging system, and do not migrate through the packaging system (compatibility). Further, the packaging system should not release substances that can accumulate in the pharmaceutical product in quantities sufficient to affect its stability (which addresses compatibility) or to present a risk of toxicity (which addresses safety) (Table 2) [2].

Findings

Granules are imported and they are processed by the automated large volume parenteral manufacturing machine to produce container (Table 3).

Market size and players

The approximate market size of Bangladeshi pharmaceutical plastic packaging materials is \$ 25 mln (BDT 200 Cr) with an average growth rate of 25%. By quantity (number of items) less than 20% of the entire market is import dependent but by value it is 30% since imported items are involved with high cost. The market growth is consistently in upward trend from last 10 to 15 years (Tables 4-6).

Technical issues of pharmaceutical packaging materials

As drug products come into direct contact with packaging systems and their plastic materials of construction. Such contact may result in interactions between the drug product and its packaging system. The packaging systems must protect and be compatible with drug products and not compromise their stability, efficacy or safety. In turn, the ingredients of a drug product should not be absorbed onto the surface or migrate into the body of the plastic packaging system.

However, top local manufacturers imports food grade virgin active ingredients for producing plastic packaging materials from Korea, Taiwan, Malaysia, Saudi Arabia, UAE, China etc. which are little costly and the pharmaceutical manufacturer have some quality parameters to select that same. Apart from basic materials working environment and machine also play role in the quality of the products.

Applications	Products
Accessories for RMG	Packaging material, bags, hanger etc.
Household, Tableware & Kitchenware	Bucket, jug, plate, glass, containers etc.
Furniture ware	Chair, Table etc.
Packaging	All kinds of food and non-food packaging
Healthcare	Toiletries (Soap case, tooth brush), Medical Accessories (blood bag, saline bag, injection, medicine container)
Building and construction	Plastic pipe, door, toilet flush etc.
Electrical and Electronic Equipment	Electrical cables and wires, switches, regulator, computer accessories, telecommunication equipment etc.
Agricultural products	Plastic pipes for irrigation and plastic films for shedding crops
Industrial Applications	Engineering parts

Table 2: Common Uses of plastic products in Bangladesh [2].

S. no.	Products	Source
1	PET bottle	Local Manufacturers
2	Cap and Closure	Local Manufacturers
3	Dropper	Local Manufacturers
4	Measuring Cup	Local Manufacturers
5	Measuring Spoon	Local Manufacturers
6	Measuring Cylinder	Local Manufacturers
7	Stopper	Local/Import
8	Eye drop bottle	Local/Import
9	Ear drop bottle	Local/Import
10	Nasal drop bottle	Local/Import
11	PVC Film	Local & Import
12	PVDC Film	Local & Import
13	Large Volume Parenteral Container (Flexible)	Local
14	Large Volume Parenteral Container (Non-Flexible)	Import
15	Infusion Set	Import
16	Pre-filled Syringe	Import
17	Actuator	Import
18	Applicator	Import
19	Spray Pump	Import
20	Special Tube-Type container	Import

Table 3: Commonly used plastic materials for pharmaceutical packaging and their sources.

S. no.	Manufacturer
1	Asia Plastic Ltd
2	Best Plastic
3	Bismillah Plastic
4	Chistia Plastic Ltd
5	DFL Plastic
6	Diba Plastic
7	Hasan Polymer Ltd
8	Jamuna Plastic Ltd
9	JMM Traders
10	JS Plastic Ltd.
11	Leos Plastic Limited
12	Liza Plastic Limited
13	Luna Plastic Ltd
14	MA Polymer
15	Metalon Industries Ltd
16	Moiroy Plastic Limited
17	Padma Polymer
18	Pharmatech Polymer
19	Piticon Industries Ltd
20	Polycon Industries Pvt Ltd
21	Saif Plastic Ltd.
22	Sanai Plastic
23	Square Plastic
24	Sun Enterprise
25	Sunrise Plastic
26	ZK Plastic Limited

Table 4: The major local suppliers.

Top local manufacturers have world class high standard machine and environment for producing plastic packaging materials but some other plastic manufacturer is far behind that standard.

S. no.	Company	Country of Origin
1	Wuxi Sunmart	China
2	Nuplas	Dubai
3	Rexam	France
4	ACG	India
5	Struble	Germany
6	Bilcare	India
7	Bprex Pharma	India
8	Doctor Pack	India
9	Meditalia	Italy
10	F.D. Enterprise	Taiwan
11	JOMA	Austria
12	BestPack	UK

Table 5: The major foreign suppliers.

S. no.	Company	Contribution %
1	Square	18
2	Incepta	10
3	Beximco	8
4	Opsonin	6
5	Renata	5
6	Eskayef	4
7	Aristopharma	4
8	A.C.I.	4
9	Healthcare	4
10	Acme	4
11	General	2
12	Others	29

Table 6: Company-wise approximate contribution (%) in total demand.

The pharmaceutical companies who are exporting medicine to semi-regulated and regulated markets are very careful about the sources of plastic materials since there are some strict guidelines for packaging materials from regulatory body. Therefore, they expect certain SOP (Standard Operating Procedure) and COA (Certificate of Analysis) from the plastic manufacturer. Therefore, these export oriented companies limited their purchase only from top class plastic manufacturer.

Import issues

PVC/PVDC films, Flexible large volume parenteral container, Special Tube Type Container, Infusion Set, Pre-filled Syringe, Actuator, Applicator, Spray Pumps are the items that import on regular basis. Some local companies are manufacturing PVC/PVDC film but due quality, appearance, perception and price they are not getting good market access. Special Tube Type Container is used by very few pharmaceutical companies and quantity is not very high. Therefore, local manufacturer is not interested to produce that same but they have the capacity to do it. Flexible large volume parenteral container, Infusion Set and Pre-filled Syringe production involved with very sophisticated technology; hence, local companies are not manufacturing it. Some containers for sterile liquid preparation like ophthalmic sterile liquid container are being imported since desired sterilization facility is unavailable but these containers are easy to manufacture. However, import of pharmaceutical packaging items also involved with some challenges like long lead time, uncertainty, high duty, price increment in final goods etc. (Table 7).

Growth potential

The growth of this industry is directly proportional with the

growth of pharmaceutical industry. The market growth of this industry is expected to be very high since both local and global market of Bangladeshi pharmaceuticals is growing very fast. Some top plastic manufacturers are planning to export pharmaceutical packaging to Europe and America where market size is robust. Pharmatech Polymer is setting up dedicated plant for pharmaceutical plastic packaging, Pran Group is focusing on pharmaceutical plastic solution, Square and Acme are extending their facilities to produce plastic packaging materials. These all indicate that local companies are improving their capacity and quality in plastic packaging which is giving hope in import reduction, ultimately increase in local product demand.

Recommendation for the improved market access by local manufacturers

Quality of basic materials: Pharmaceutical plastic packaging materials needs to be produced from Food Grade Virgin materials but there are some manufacturers who are using general grade materials to minimize the cost. Local manufacturers are importing basic materials from different sources and producing the final goods here. Due to changes in sources of raw materials quality of final goods sometimes become changed. Therefore, quality of basic materials needs to be ensured.

Technological Up-gradation: Still now our producers are not in shape enough to produce so many items due to technological limitation. Also, there are some companies who use semi-automated or manual machine where chance of contamination is very high. To avoid such limitations technological up gradation is utmost priority.

Working environment: Although very few companies have good working environment and supplying packaging materials to multinational companies but many companies are not marinating pharmaceutical standard. Even there are some companies who have not any SOP for meeting the compliance.

Documentation: In case of pharmaceutical plastic packaging item production documentation is basic requirement but our local manufacturers are putting very less attention on that. This issue needs to be addressed to meet regulatory guidelines.

Innovation: In maximum cases our manufacturers usually collect samples from different sources including pharmaceutical companies and produce the copy products. They have limited or no RandD facilities. Due to this limitation, aesthetic value of local products is behind the global standard and there is no variation in size and shape. Therefore, innovation in size, shape and appearance is important.

S. no.	Item	Underlying Cause of Import
1	Stopper	Quality/Limitation in technology
2	Eye drop bottle	Sterilization facility
3	PVC/PVDC Film	Quality and ircle issue
4	LVP Container (Non-Flexible)	Limitation in technology
5	Infusion Set	Limitation in technology
6	Pre-filled Syringe	Limitation in technology
7	Actuator	Limitation in technology
8	Applicator	Limitation in technology
9	Spray Pump	Limitation in technology
10	Special Tube-Type container	Since required quantity is not vast so local manufacturer are not interested to manufacture

Table 7: At a glance item-wise underlying cause of import.

Entrepreneurship: Except one or two there is no dedicated pharmaceutical plastic packaging manufacturer in the country. Those who produce pharmaceutical plastic packaging materials also produce other plastic items. For pharmaceutical supply, additional precaution and sensitivity are required which involved high cost whereas by using the same cost more output can be obtained in other items as quality issues do not get so priority. This motivates the entrepreneurs to make a check and balance between pharmaceutical packaging and other items which have a direct impact on quality standard. Therefore, if some dedicated plants are established then a class of manufacturers can be distinguished themselves from others and will easily get more market access considering quality parameters.

Conclusion

Considering the recent growth of pharmaceutical industry and

technological upgradation in the plastic materials it is assumed that there is a huge market potentiality for pharmaceutical plastic packaging materials. If the local manufacturers concentrate on quality and innovation, then they will be able not only to capture the entire local market but also to enter the export market which is robust.

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