REPORT ON
COMPARATIVE TESTING OF BABY DIAPERS

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ARE DISPOSABLE BABY DIAPERS SAFE FOR YOUR BABY?

BABIES & THEIR HYGIENE

United Nations has formulated 17 sustainable development goals of which sanitation and hygiene by 2030 is a key goal. Poor sanitation and hygiene results in high infant mortality and death of children under five.

In our country only 11% of rural families dispose children’s stools safely. 80% of children’s stools are left in the open or thrown into garbage. There are 2 things as precious as a new born baby and parents want the very best for their child - one the food they give to their baby and the diaper they use for their children.

INTRODUCTION OF DISPOSABLE DIAPERS

Disposable diapers have absorbent chemicals and are thrown away after use. Plastic pants were worn over diapers to avoid leaks. However with modern diapers this is not required.

The modern diaper began to take shape in the 19th century. Cloth diapers in United states were first mass produced in 1887 by Maria Allen. In the 20th century the disposable diapers were conceived. In 1930s Robinson of Chesterfield had made “Destroyable Babies Napkins.”

MODERN DIAPERS AND THEIR COMPOSITION

A Diaper is also called a nappy. It is a type of underwear that allows the wearer to defecate or urinate without use of Toilet. It absorbs and contains waste products to prevent soiling of outer clothes or external environment. In earlier days cloth diapers were used and were reused after laundering.

The diaper becomes soiled, they need to be changed. Failure to change a diaper on a sufficiently regular basis can cause skin problems around the area covered by a diaper.

Diapers are made of cloth or synthetic disposable materials. They are expected to provide maximum comfort to the baby and maximum convenience to the wearer.

The average diaper is comprised of

1) 43% pluff pulp
2) 27% absorbent polymer
3) 15 to 23% polypropylene/polyethylene
4) 5% adhesive
5) 1% elastic.

The non woven fabric should be 20 to 25 GSM
QUALITY REQUIREMENTS OF DIAPERS

a) Diapers shall have high degree of softness.
b) High absorbency. The desired rate of absorption should be very fast (ie) within 5 to 7 secs
c) No leakage
d) No rewetting and skin irritation.
e) Comfortable and good fit.
f) Environment friendly - disposable.
g) They shall be made of clean bacteria free and highly absorbent cotton pulp and tissue papers both should not have an unpleasant odour when wet or dry.
h) Easy to wear

Classification

Diapers shall be classified according to the weight of the baby it is meant for as in Table 1.

<table>
<thead>
<tr>
<th>Category (informative)</th>
<th>Baby weight, kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small</td>
<td>Up to 6</td>
</tr>
<tr>
<td>Medium</td>
<td>6.1 – 9.0</td>
</tr>
<tr>
<td>Large</td>
<td>9.1 – 15</td>
</tr>
<tr>
<td>Extra large</td>
<td>Above 15</td>
</tr>
</tbody>
</table>
The diapers are classified according to the baby weight and not according to category.

The upper limit of the weight range shown on the pack is used to determine the baby weight category.

The size of the category is consistent with the standard dimensions as required by the market.

MATERIALS
The materials used for making the diapers shall be clean, bacteria free, and highly absorbent. They shall not harm the baby’s skin and should not have any unpleasant odour when wet or dry.

The absorbent core shall:

a) Consist of cellulose fibres and superabsorbent polymer and shall be contoured for better fit between the legs. It shall have a comfortable feel and shall ensure complete dryness and prevent growth of bacteria;

b) Be clean, free from harmful foreign materials, lumps, splits, holes, and protruding points when visually examined; and

c) Be arranged in a manner that will speed up the absorption of urine and keep it away from the baby’s skin.

THE TOP SHEET (THE LAYER WHICH CONTACTS THE BABY’S SKIN) SHALL:

a) Be of material capable of allowing fluid to pass readily through to the next layer and shall resist moisture return to the skin. It shall have no harmful effects;

b) Cover the absorbent core completely and prevent the core from reaching the baby’s skin or clothes under normal handling; and

c) Have high degree of softness and shall cause no irritation to the skin.

THE BACK SHEET (OUTER COVER)

a) Shall be moisture impervious and shall prevent direct contact of the absorbent core with the baby’s clothing and there shall be no liquid leakage out of the diapers; and

b) Should be breathable and comfortable for the baby.

- There shall be a device for ensuring a good fit of the diapers on the baby’s femurs and to prevent leakage at the femurs without causing rubefacient effects.
- There shall be a suitable device for fastening the diaper at the waist for secure use without causing rubefacient effects.
- Adhesive used shall prevent shifting of the absorbent core.
- Each material component of the diaper should be bound to the adjacent component to enhance strength and prevent shifting of the absorbent core.

SELECTION OF DIAPERS

Competition in the baby care market is stiff. Numerous branded products at various prices compete for man’s attention. Windows for baby care products is relatively short. Babies spend on an average 3 years in the diaper market.

For mothers to achieve maximum advantage in a space dominated by only a handful of brands of products like diapers, a deep understanding of what’s a driving a product choice is critical
For a better understanding consumers select one baby diaper over another and to determine what motivates brand switching behavior needs a survey on user perception along with a bit analysis of products quality too. Always price is the dominant driver in the Indian market. Positive word of mouth and health related reasons may be the 2nd highest reason.

**CHOICE OF DIAPERS**
Price per piece is the top priority while choosing diapers - consumers are seeking options that are gentle on their babies skin. This is the most important attribute on deciding the brand to purchase. Good fit / comfort, leakage prevention are also attributed as the reasons for choice of brands.

CONCERT has chosen the following 8 brands of baby diaper pants for comparative testing.

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Brand Name</th>
<th>Manufacturer Name And Address</th>
<th>Size</th>
<th>For Baby Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Huggies Wonder Pants</td>
<td>Kimberly-Clark Lever Pvt. Ltd., Pune, Maharastra-412208</td>
<td>M</td>
<td>7-12 Kg</td>
</tr>
<tr>
<td>2</td>
<td>Pampers</td>
<td>Procter &amp; Gamble Home Products Mandideep-462046, MP</td>
<td>M</td>
<td>7-12 Kg</td>
</tr>
<tr>
<td>3</td>
<td>Libero Pants</td>
<td>Sca Hygiene Malaysia</td>
<td>M</td>
<td>7-12 Kg</td>
</tr>
<tr>
<td>4</td>
<td>Supper Teddy</td>
<td>Nobel Hygiene Pvt Ltd. Sinnar-422113, Maharastra</td>
<td>M</td>
<td>6-11 Kg</td>
</tr>
<tr>
<td>5</td>
<td>Mamy Poko Pants</td>
<td>Unicharm India Pvt Ltd Gurgaon, Haryana 122002</td>
<td>M</td>
<td>7-12 Kg</td>
</tr>
<tr>
<td>6</td>
<td>Be Be Smart Pants</td>
<td>Realcare Hygienic Products Pvt, Ltd. Ambatur Industrial Estate, Chennai-58</td>
<td>M</td>
<td>5-11 Kg</td>
</tr>
<tr>
<td>7</td>
<td>Champs Diapers</td>
<td>Safilo Healthcare Factory Morbi- 363642(Guj.)</td>
<td>M</td>
<td>7-12 Kg</td>
</tr>
<tr>
<td>8</td>
<td>Easy Fit</td>
<td>X'cel Healthcare Products Indore-452003 Madhya Pradesh</td>
<td>M</td>
<td>5-9 Kg</td>
</tr>
</tbody>
</table>

**DIAPER MARKET**
Diaper use in India has traditionally been limited primarily for special occasions outside the home. It is still in its nascent stages and manufacturers must convince consumers to not only buy their brand but to purchase diapers of any kind.

Diaper pants popularity is on the rise. While open diapers (traditional taped diapers) are the largest segment and experienced strong growth in recent times, the growth rate of diaper pants, which slide on, has been driven by their convenience, comfort and competitive prices.

Diaper pants are extremely easy to use and they are also airier and can be more comfortable than regular diapers which need to be taped and hence are tighter than pants.

**KNOWLEDGE ON DIAPERS**
Around the world consumers have fewer sources to learn about diapers. Most commonly used source is recommendations from friends and family. Television advertisements are the second most commonly used platform. In India the opinions of health care experts on the choice of diapers are not relied upon heavily. In some families the medical community often stick with the diaper brand that is received at the hospital at the time of discharge after birth of a baby.
Young couples of the these years equipped with digital technology learn about diapers on parenting websites / brand / manufacturer’s websites, baby blogs and online ads. It is reported that the use of social media is particularly high in our country. Generally word of mouth and traditional advertising are most impactful sources of information.

COMPARATIVE TESTING

Comparative Testing is a formal process by which different brands of a product are tested for Quality, and for conformance to the minimum standards laid down by Bureau of Indian Standards. Such a test also reveals, if a particular tested brand exceeds such minimum standards, whether there can be potential health and safety hazards and verification of special claims by manufacturers, if any.

The results for all the tested brands are published in a Comparative Test Report which would provide consumers information to make an informed choice.

CONCERT has undertaken this project for the southern region under a grant from Department of Consumer Affairs, Government of India for the year 2016-17. Baby diapers is one which has become a household product for most of the families where newly wedded couples are there.

TESTING OF BABY DIAPERS

Comparative Testing of baby diapers was taken under the following three different headings

- Packaging & Labelling
- Quality aspects of the product
- Health and Safety parameters

In the absence of BIS specifications for baby diapers the analytical results are compared on the basis of merits of the tests and advantage of products to the babies.

PACKAGING AND LABELING

Diapers shall be packed in a suitable package that shall protect them from any form of contamination and damage. Packaging for shipment shall be in accordance with the manufacturer’s standard practice and in a manner readily accepted by the market. Within the shipping carton, units shall be packed in a manner designed to minimize damage during shipment due to rough or improper handling.

LABELLING

The diaper packs shall be marked with legible and indelible pre-printed marking or a securely affixed and durable label bearing the following information:

1. **Name of contents:** Is described as disposable diaper pants or baby diaper pants
2. **Name and address of the manufacturer:** Only one brand is imported from Malaysia. Others are of Indian origin.
3. **Number of diapers:** Packing varies from 18 numbers to 44 numbers

The number of diapers packed varied from 18 to 44. Brands Huggies and Champs had the lowest number 18. The average mean weight of diapers were recorded by the SITRA Lab, Coimbatore where they were tested and at CONCERT’S lab for verification. Brand Huggies had two different sizes one
weighing 15.8 to 16.5 grams and other weighing 26.8 to 30.8 grams. Nearly one fourth (28.5%) of the samples were lesser in weight indicating that two different size products have been packed in one packet. It is definitely a deficiency in the product supply.

4. **Size or dimension of diapers**: All Medium size diapers were taken for testing.

5. **Weight of baby that the diapers is meant for**: Varies from 5 kg to 12kgs mostly 7-12 kgs

6. **Instruction for storage and disposal**: Only 2 manufacturers Super Teddy and Mamy Poko has advised to store in cool and dry place. Other 6 brands did not give the storage condition.

   **Advise for disposal**: 5 labels advice customers not to flush. Brand Libero advises to roll up and dispose off. Two manufacturers did not mention any thing about disposal.

7. **Date of manufacture and expiry**: Easy fit did not mention the expiry period.

8. **Batch/ lot number**: Not available in Teddy and Easy fit.

9. **Country of origin**: Mentioned in all brands

10. **Any perfume, lotion and powder added on the top sheet**: Pampers has added some baby lotion. Brand Libero has mentioned to have used chamoline, olive oil, Vitamin E, aloe Vera skin friendly ingredients. Champs has used aloe vera and neem premium fragrance. Remaining 5 brands are silent about addition of fragrance etc.,

**There is no BIS specification for the manufacture of disposable diapers in India.**

Under this heading in addition to the above mentioned ten characters the following information were also verified and recorded

11. **Customer care number or email ID**: Were present in all the labels

12. **Absorption time**: Is noted as 12 hours in 4 brands (Huggies, Pampers, Mamy Poko and Champs). Other brands have not noted the time of absorption of urine. May be hours of absorption vary according to the individual baby’s urine amount.

13. **Procedure to wear and to remove**: Was available in all the brands.

All the above points were considered for scoring and rating under packaging and labeling.

**HEALTH AND SAFETY**

Health and safety of diapers needs to be given much importance as mothers are more concerned about their baby’s health. Most of the quality parameters indirectly affect the health of babies if they fail in their characteristics. Hence consumers are requested to relate the quality parameters in conjunction with safety of the products.

However, an exclusive test has been carried out microbiologically to ascertain the safety of all baby diapers. The total bacterial load, yeast and mould count and the presence of E-coli were tested. All the brands passed in these three tests.

**QUALITY PARAMETERS**
For the information of consumers a few of the important tests done under quality aspects are explained.

1. Total absorptive capacity of diaper - Maximum absorptive capacity is best
2. Fluid run off quantity - The surface effect of baby diapers shall be zero.
3. Centrifuge retention capacity - CRC of loose super absorbent particles shall be high
4. Rewet & acquisition time - The time to rewet shall be less
5. Mean weight of baby diaper - Weight of diaper shall have maximum absorption
6. Wetting time - Of top & bottom layers in seconds shall be minimum
7. Absorption rate - In percentage per second shall be higher
8. Repeated liquid strike through time - 3rd time in seconds shall be lower is good
9. Air permeability - Higher is good quality
10. Percentage of 1 way transport of liquid - Higher is excellent.

**Scoring and Rating**

**SCORING METHOD ON 5 POINT SCALE**

All the eight brands of diapers were tested at SITRA lab which is a nationally renounced research lab on textiles, more than 13 tests were carried out for top layer and bottom layers wherever necessary. All the analytical data were computed and compared for scoring and rating.

Each criterion, sub-parameter, and parameter is rated individually on a 5-point scale. The rating given is 1 (Poor), 2 (Fair), 3 (Good), 4 (Very Good) and 5 (Excellent).

The final table including quality characteristics for each brand is attached for consumers reference. Brands Libero, Super teddy, Mamy Poko and Easy fit have scored Good and above. Brands Huggies, Pampers, Champs and BE BE Smart pants have scored poor and below as far as quality characteristics are concerned.

**FINAL SCORING & RATING OF COMPARATIVE TESTING OF DISPOSABLE BABY DIAPERS**

<table>
<thead>
<tr>
<th>State</th>
<th>BRAND NAME</th>
<th>HUGGIES WONDER PANTS</th>
<th>PAMPERS BABY-DRY PANTS</th>
<th>LIBERO PANTS</th>
<th>SUPER TEDDY</th>
<th>MAMYPOKO PANTS</th>
<th>BEBE SMARTPANTS</th>
<th>CHAMPS DIAPERS</th>
<th>EASY FIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packaging &amp; Labelling</td>
<td>Good</td>
<td>V.Good</td>
<td>Good</td>
<td>Good</td>
<td>V.Good</td>
<td>Fair</td>
<td>V.Good</td>
<td>Poor</td>
<td></td>
</tr>
<tr>
<td>Quality</td>
<td>Poor</td>
<td>Poor</td>
<td>V.Good</td>
<td>Good</td>
<td>Good</td>
<td>Fair</td>
<td>Poor</td>
<td>Good</td>
<td></td>
</tr>
<tr>
<td>Health &amp; Safety</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
<td>Good</td>
<td></td>
</tr>
</tbody>
</table>

**DIAPER TESTING LAB**

THE SOUTH INDIA TEXTILE RESEARCH ASSOCIATION (SITRA)
13/37,Avinashi Road, Civil Aerodrome Post, Coimbatore 641014
Phone: 0422–4215349 / Mob.No: 09865808954
E.Mail; coephy@sitra.org.in / Website: www.sitrameditech.org.in
USER PERCEPTION OF BABY DIAPERS

User Perception of diaper users was obtained from 79 young mothers who use diapers for their babies. A questionnaire in Tamil was prepared with 10 most probable questions- including the number of diapers used ,time of use of diapers, discomfort felt if any by their babies and the purpose of using diapers etc.,

Altogether 79 Mothers actively participated in the above exercise with more queries from their end.

- Since the survey was targeted only against mothers using diapers for their babies there was no negative answer for using diapers as a convenience product.
- The longevity of the use of diapers for their child by mothers was higher with young babies and the period of use decreased as the child grew older
- More number of babies used diapers up to 6 months and its use reduced at the age of 3 years.
- Preferred brands of diapers were Huggies and Pampers followed by other brands.
- More than 75% of babies (78%) used diapers only when they went out(16%) some of them used only during nights.
- Regarding the number of diapers used per day one third of respondents used only 2 numbers and 2/3 used 3 to 5 diapers in a day.
- Regarding if any discomfort felt by their babies due to the use diapers, 25% said occasionally 12% said after wetting. 25% said, they did not feel any discomfort.
- Nearly 60% did not consult any Doctor regarding the use of diapers for their child. 21% said they did consult a Medical officer on this issue.
- Regarding the likes and dislikes and the use of diapers, 52% of mothers said that their child accepted the use of diaper without any hatred, whereas nearly 25% said they did not like its use.
- Nearly 68% of mothers wanted to continue the use of diapers for the comfort and convenience of their child. But 29% of them preferred it only when they went out.
- 87% of mothers were very much satisfied with the use of diapers for their babies and have given ranking as “Very good” “Good” for the comfort it provides.

TIPS TO CONSUMERS ON BABY DIAPERS

Demand for baby diaper is largely driven by rapidly expanding infant population and increased awareness of personal hygiene. The growing participation of women in the workforce, increasing disposable incomes along with increasing purchasing power is ensuring high growth.

TIPS TO CHOOSE BABY DIAPERS

- A baby goes through an average 5000 diaper change before starting moving on and walk freely.
- Choose safe, rashes free and eco friendly diapers
- Select suitable size diapers according to the weight of baby
• Chlorine free diapers keeps baby toxin free
• Biodegradable materials can be thrown away with clean conscience
• Avoid diapers containing harmful dyes, lotions and fragrances
• Diapers made of naturally absorbent materials may be safe
• If irritation persists avoid using such diapers
• Abnormal colour change of skin (especially redness) indicates unsuitability.
• In case of allergic symptoms consult your physician.
• Read the contents of the label thoroughly before opening and using
• When in doubt contact the manufacturer through consumer contact number
• Don’t hesitate to complain in case of improper response.
• Deficiency in size, number of diapers could be taken up under legal metrology rules 2011.
• Complaints under Drugs and Cosmetic Rules 1945 and consumer protection Rules 1986 may be also be made.

Mr. C.R. Venkateswaran, CONCERT LEAD (BABY DIAPER)

The EAC members are:
  1. Mr. G. Santhanarajan, Project Manager, CONCERT
  2. Mr. Navil H. Mohta, Consultant, CONCERT
  3. Mr. S. Muthaiyan, Consultant, CONCERT

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