Death by Burning:

The Need for Safer Fabrics

by

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ACCORDING to a government of India publication *(Accidental Deaths and Suicides in India,* 1982) at least 14,911 persons died of burns and explosions in 1982. This figure is obviously an underestimate as many of the deaths among a majority of our population (rural) would not get recorded.

Breakdown by sex is not given in the publication but we can assume that a significant proportion of these were women. A study done by Dr M.H. Keswani shows that 38 percent of burn deaths in Bombay and 76 percent in Pune were women in 1980. As far as nonfatal burns are concerned we really do not have a clear idea for the actual incidence in India as a very large proportion of burns go unreported.

A rural study done by us indicates that the incidence of burns which disable women from normal activity for at least one day are about four per thousand women (including children) per year. This would extrapolate to over a million serious burns among women in India per year. Whatever the actual figures, such numbers make it clear that burns are a serious problem among women in India and we have to give much more importance to prevention of burns than we have given up to now.

The best way of preventing fires and burns is to make it difficult or impossible for sources of heat to come in contact with human beings, and to reduce temperatures of hot objects as much as possible. Another way is to use products which are less likely to explode or catch fire. For example, it is much safer to use the multiwick Nutan stove instead of the pressure stove.

Clothes catching fire is one of the most common causes of serious burns, especially among women. These fires are caused generally by a combination of factors:

* Use of long flowing garments like *saris.* Ends of *saris* can fall into flames without the wearer realising it. Six yards of a *sari* provides a lot of material to continue burning.

* Inadvertent or intentional splashing of inflammable liquids like kerosene onto clothes.

* Explosion of pressure stoves.

* Lit cigarettes and matches coming into contact with clothes.

Most burn prevention messages advise women not to wear synthetic *saris* while in the kitchen. *This advice is not supported by scientific reasoning.* Research done over the last 10 years does not show cotton to be safer than *all* synthetics. Flammability characteristics of the most common textile fibres are shown in Table 1 in terms of "limiting oxygen index". Air contains 21 percent oxygen. So those fabrics which have a limiting oxygen index of *more than 21 do not burn easily.*

Some experiments have been done on amount of heat produced by fabrics when burned over an instrumented human-like dummy. The results of one of these experiments in terms of a burns severity index are shown in Table 2 for various textiles. Higher index values mean more heat is produced, which can cause more serious burns. This index is a measure of the minimum proportion of oxygen necessary in the environment for a material to burn freely.

Both the tables show that cottons

and rayons are the most flammable (catch fire easily) of the fabrics as compared to polyesters and silks. However, this does not mean that synthetics can be said to be better than cottons under all conditions, because there are other considerations like melting and sticking to the skin. Fabrics which char can retain a glow as long as the surrounding temperatures are high, for example, in the case of house fires. The charred fabric does not stick to the skin and can fall off whereas melted material can stick to the skin and burn it for a longer time.

Some of these advantages and disadvantages are summarised below:

Flammability Rayon and cotton are more flammable than nylon, silk, polyester and wool.

Melting is both an advantage and a disadvantage depending upon the situation. In many cases the material melts and shrinks away from the flame and so reduces the possibility of the rest of the fabric catching fire. Or, a melted end of a garment can fall away and so the fire does not spread. The disadvantage is that if the garment is close to the body it melts and then sticks to the skin causing more severe burns. Melting fabrics can also drip onto other parts of the body.

Table 1: Flammability characteristics of textitles

Fibre	LOI	Characteristics
Acrylic/acetates(rayon)	17-18	Ignite and burn easily
Polypropylene	18-20	,,
Cotton, linen, visconse	18-28	Ignite and burn easily, do not melt.Char.
Nylon, Polyester	20-22	Do not ignite easily, melt
Silk	23	Do not ignite or burn easily
Wool	24-25	Char rather than melt
Modacryclic	25-30	,,
Fire resistant fabrics	27	Self extinguishing

Fabric thickness The thinner and more loosely woven the fabric, the more easily it will catch fire. However, if the source of heat is such that it sets fire to any material (large fires like house fires, bed fires, fires started by kerosene) then thicker materials once they start burning produce more heat to cause deeper burns.

Since cotton garments are much more comfortable in the summer than synthetics and because cottons do not melt, it is quite clear that we really do not have a clear choice on which fabrics to choose! What is certain is that *cottons are not safer than synthetics under all conditions.* The following guidelines can be kept in mind to be safer:

(i) Long flowing garments and garments which have hanging sashes etc. are more likely to catch fire.

(ii) Body fitting garments are less likely to fall into flames.

(iii) In the case of *undergarments*, *synthetics* cause *more* severe burns than *cottons* if the outer garment is on fire. Therefore cotton underwear should be preferred to synthetic ones.

If you are wearing a cotton shirt and nylon underwear you can get badly burned when the underwear melts. However, a person with a nylon shirt and cotton underwear would survive with much less severe burns.

Fire Retardant Fabrics

A great deal of work is being done abroad to add fire retardant chemicals to fabrics. As Table 1 shows, fabrics treated so are much less flammable. Addition of these chemicals increases the price a little bit and makes the fabrics a little bit stiffer.

Since burns are a serious problem in India it is criminal that our textile manufacturers do not give Indian consumers a choice to buy fire resistant fabrics. Century Rayon introduced one line of fire retardant *saris* a few years ago but then discounted it in the absence of "consumer demand." It is not clear if the consumers were adequately informed or the fire retardant *saris* promoted through an advertising blitz to edge out less safe products. In any event, it is quite clear that neither the government nor the manufacturers have taken the issue seriously enough.

Speaking at a national seminar on fire

Table 2: Burn severity of various textiles (simulated on "thermon-man").

Textile	Burn severity index
Cotton	88
65/35 Polyester cotton	53
Acrylic	25
Acetate	24
90/10 polyester silk	5.9
Wool	5.6
Polyester	0-1.5

retardant finishing in textiles, in Bombay, in 1981, Dr Sharma of Century Spinning and Manufacturing Company complained that "Why flame retardant finishes are not catching up to the same extent as other special expensive finishes on 100 percent cotton fabric is difficult to understand. It is now high time to sort out ways and means of popularising flame retardant finishes in India."

Almost eight years have gone by but the Indian public is still as unsafe and vulnerable to burn injuries. This reflects the attitudes of our policy makers who are more preoccupied with "modern" diseases of the rich than with a health problem which disables thousands in India every year. Consumers in India do not know that Switzerland passed a law prohibiting manufacture of easily flammable textiles as far back as 1964. By the early 1970s, most rich countries had such laws.

The fact that safety is not expensive is not widely appreciated. Experts estimate that a *sari* treated with fire retardant materials should add only about Rs 3 to Rs 5 to the basic cost. However, the myth still prevails that safety is very expensive.

Unfortunately, not enough research has been done in India on fire retardant fabrics for civilian uses. Some pioneering work has been done at IIT, Delhi, IISC, Bangalore, Bombay Textile Research Association, Ahmedabad Textile Industry's Research Association and the Defence Research and Development Organisation. Much of this work is for the defence forces and for developing safety apparel for occupational purposes.

Researchers claim that fire retardant finishing will not be durable for the lifetime of fabrics in India, and so *we are given no protection at all.* Instead of funding more research to solve these problems for Indian conditions, we prefer to ignore them.

It is high time that consumers demand fire retardant finishing of *saris* and flammable fabrics. What we need is a movement to demand legislation for safer fabrics. In the meantime, it may be useful to file lawsuits against manufacturers for not providing safe clothing, and writ petitions demanding action from the government. It may be the only way to get things moving. ❐