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Availability Of UV-Protective Clothing In Chennai Market: An Evaluation Study

[1]* Habeebunissa, [2]Anish Sharmila M, [3] Sasirekha

[1]Research Scholar, Department of Fashion, Design and Arts, Hindustan institute of Technology and Science, rp.21703007@student.hindustanuniv.ac.in, Orcid Id: 0000-0003-1563-7664
[2],Assistant Professor , Fashion, Design and Arts, Hindustan Institute of Technology and Science, Chennai, India, anishs@hindustanuniv.ac.in
[2*] Corresponding Author: Anish Sharmila M
[3] Associate Professor, Department of Fashion Management Studies, NIFT- Chennai, India, sasirekha.a@nift.ac.in

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Abstract
The global analysis of the apparel market focuses on the supply and demand for UV protection clothing, acknowledging the paramount importance of shielding against solar UV radiation, which is the primary cause of skin damage, including skin cancer. Reports indicate a limited presence of UPF apparel in the Asian market. However, it is anticipated that the UPF clothing business will undergo development in Asian countries in the foreseeable future. This study delves explicitly into the availability of UV-protective clothing in India, with a focus on the Chennai market. Through a convenient sampling method, the research scrutinized 80 brands across physical and online retail outlets, unveiling trends such as the prevalence of knitted fabrics and type of fibres, premium pricing, and the potential for Indian brands to diversify and align with global preferences. This comprehensive analysis is poised to deliver substantial value to clothing manufacturers, consumers, researchers, and academia.
Keywords: UV-protective Clothing, UPF Clothing, Market study, Indian Brands, International Brands.

1. Introduction

Spectral ultraviolet (UV) radiation is one of the main causes of harmful effects on uncovered or exposed skin [1]. Nowadays, sun-protective clothing, also known as UV-protective clothing or UPF clothing, is available on the market. According to the AS/NZS 4399 UPF classification system mentioned in the table below, there are different protective categories for various UV-protective clothing [2].

Table 1: AS/NZS 4399 UPF classification system [2]

UPF RANGE	PROTECTIVE CATEGORY
15-24	Good Protective
25-39	Very Good Protective
40 -50, 50+	Excellent Protective

There has been a notable increase in the use of UV-protective clothing due to a growing awareness of the harmful effects of UV radiation on human skin [3]. Long-term exposure to UV radiation has been linked to several skin conditions, including sunburn, premature ageing, Polymorphic Light Eruption (PMLE), and a higher risk of developing skin cancer [4]. The textile industry has made significant progress in creating materials that provide good UV protection in response to these concerns [5, 6]. UV-protective clothes are made with fabrics of dense construction, deeper colours, and unique coatings that have demonstrated improved UV-blocking properties. The

market for UV-protective apparel is growing as consumers become more aware and demand increases. As a result, many researchers have explored consumer preferences, attitudes, and behaviour regarding UV-protective apparel, advancing the discussion on this subject [7-9].

Dermatological studies suggest that photodermatosis is very common in dark-skinned populations [10-12]. Another study by dermatologists confirms that although there are treatments available for photodermatosis caused by sunlight exposure, it is always better to prevent its occurrence by protecting the skin with clothing [7, 13, 14]. In terms of sun-protective clothing, the textile industry has made significant advancements in textile science, leading to the production of improved fabrics with a UPF range between 25 and 50+. UPF-rated clothing is becoming increasingly important to customers worldwide, which has resulted in a wider range of products and increased market competitiveness [15]. The growing recognition of the importance of sun protection is evident in the global market report for UV-protective clothing. The global "UPF Sun Protective Clothing Market" has been steadily growing in recent years, and this trend is expected to continue until 2030 [7, 16].

Focusing on manufacturers in various countries, the worldwide market size for UPF clothing is based on application, end user, and geography, with a noticeable increase in the demand for UV-protective apparel. According to Data Bridge Market Research (DBMR) analysis [17], the global market for ultraviolet protective factor (UPF) apparel is likely to grow at a compound annual growth rate (CAGR) of 9.5% between 2023 and 2030. The market was valued at USD 745.49 million in 2022, but it is projected to reach USD 1,540.82 million by 2030.

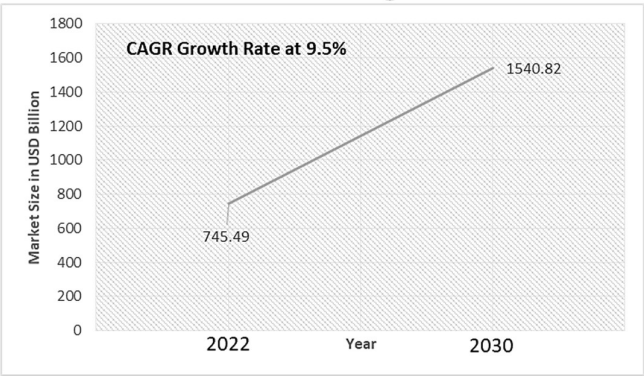

Figure 1: Growth rate of the market size for UV-protective clothing [17]

The rising customer awareness of health and well-being is one of the major factors propelling the market for UPF apparel. The increased awareness has led to a rise in the market for UPF clothing items, which are seen to be a healthier dermatologic option. The technological developments in the UPF clothing sector have also given rise to more effective and environmentally friendly production techniques, which has further boosted market expansion [15].

1.1 SWOT analysis

- There is significant demand for sun-protected garments.
- Sun-protective apparel is increasingly being incorporated into fashionable clothes in North America and the Pacific.
- North American countries are predicted to lead the worldwide UPF clothing industry with their stylish, creative, and fashionable apparel made with synthetic and regenerated fibres.
- To cater to fashion-conscious consumers, manufacturers must take advantage of the need for stylish UPF apparel options.
- The rising demand for UPF apparel is partly due to the expanding appeal of outdoor recreation and travel.
- There will be no compromise on comfort, style or performance, as sought after by athletes, vacationers, and outdoor enthusiasts.

- Owing to specialized fabrics and manufacturing processes, UPF clothing is more expensive, which may deter some buyers.
- Producers in the UPF clothing industry need help to strike a balance between performance and cost.
- High-sun exposure areas see a spike in demand for UPF apparel, particularly in the summer, which presents problems for inventory and production management.
- Asia-Pacific, which includes India, is expected to develop profitably between 2022 and 2032 because women prefer more skincare products, which are accessible both online and in physical stores [17].

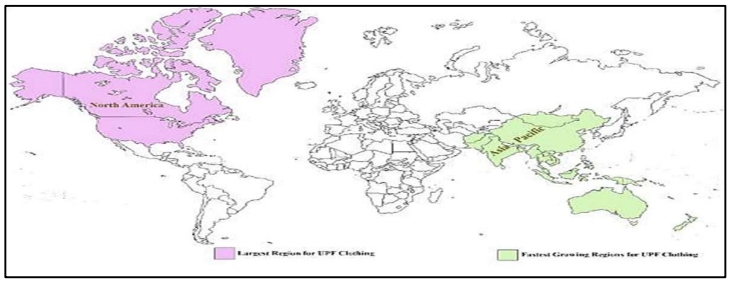

Figure 2: UV-Protection factor sun protective clothing market- Regional Outlook 2022-32 [18]

There are two distinct categories of artificial fibres: synthetic fibres and regenerated fibres. Regenerated fibres are derived from naturally occurring cellulose polymers found in plants such as cotton, wool, hemp, and flax. Notably, rayon and acetate, among the initial artificial fibres to be developed, were created from cellulose polymers through the conversion of plant cellulose into fibres. On the other hand, synthetic fibres are exclusively derived from polymers sourced from natural gas and petroleum by-products. This category encompasses nylon, acrylics, polyurethane, and polypropylene. The global production of these fibres amounts to millions of tons annually. Textiles are flexible materials made of yarns, created through weaving, knitting, or other methods. They come from animals, plants, minerals, or synthetic materials. Weaving involves interlacing long threads. Knit fabric is created by interlooping yarn and is flexible, durable, and used for making various clothing items like T-shirts, polo shirts, innerwear, and leggings. "Interlacing threads create woven fabric on a loom. It only stretches diagonally and is commonly used for sewing shirts, trousers, and jeans. The edges need to be finished properly to prevent unravelling." A thorough worldwide market research study on UV-protective clothing is available in the literature; however, there needs to be a significant research gap regarding the availability of UV clothing in India, particularly in the Chennai market. Additionally, while data about the type of fibre used in UV-protecting apparel is readily available, more is needed about the decision between woven and knit fabrics for UV-protective clothes. Furthermore, there is a notable lack of study concerning the classification of clothing categories for UV-protective apparel, such as casual wear, formal wear, etc. The DBMR report states that synthetic fibres are used in UV clothing globally, but it does not mention the use of latest regenerated fibre. Therefore, this study fills the gap in understanding the use of fibres. It is also important to understand the fabric construction technique used for UV-protective clothing for a comprehensive approach to understanding UV-protective clothing.

Related works

The study [19] claims that sun exposure can cause UV radiation, which can cause skin damage, such as sunburn, early ageing, and skin cancer. UV transmission can be decreased, and skin protection can be achieved by modifying textile materials and applying appropriate finishing chemicals. UV blockers that work well are inorganic nano-metal oxide particles, such as ZnO and TiO2. The variables influencing UV protection in textiles and the different UV protection standards are covered in this study. In a similar vein, the study [20] talks about how useful UV-protective apparel is and how washing can cause UPF values to drop. Concerns are brought up regarding UV finish requirements, sustainability, and disclosure of UV-protective textiles.

The study [21] examines the ways in which the textile industry is advancing functional finishes in response to the increasing need for better personal protection equipment. This includes resistance to solar radiation, the degree of which varies according to the kind of cloth, its chemical makeup, and its intended application. Various UV absorbers and nanomaterials have been investigated in research to improve performance and longevity. This paper examines the effects of UV radiation on people, the requirements for UV protection, and the guidelines for determining UPF. According to the author [22], exposure to ultraviolet radiation (UVR) is the primary risk factor for skin cancer. In one study, broad-spectrum sunscreens and sun-protective textiles were tested for their ability

to block UV rays. In comparison to the sunscreens tested, the study discovered that the fabrics provide better UVR protection. According to the findings, clothes should be the primary means of protecting against UV rays, with sunscreen being useful in places where clothing is difficult. The study [23] looked at clothes, which are crucial for shielding oneself from the sun's damaging UVR rays. They examined the UVR protection of fifty different clothes. While regular shirts offer very little protection, particularly against photoaging, most knitted sports T-shirts offer great protection. With an exponential link to the UV protection factor (UPF), the fabric cover has the biggest effect on protection. Summer clothing textiles should have information regarding UV protection labelled on them, as some materials—especially those used for shirts—offer very little UV protection.

It has been suggested by [24] to wear garments to shield yourself from the sun. Not every cloth offers the same degree of UV defense. Only half of the 236 materials used in garments were found to meet the suggested UPF 30+ level. Higher UPF values were found in materials including wool, polyester, and fabric blends, whereas lower UPF values were found in cotton, linen, and viscose fabrics. The study recommended that summer apparel textiles be subjected to conventional testing and labelling. The study [25] examined the relationship between UV radiation from the sun and skin damage, including skin cancer. In addition to protecting the skin with sunscreen, appropriate clothing can help avoid photosensitive conditions, skin cancer, and premature ageing of the skin. However, not every apparel offers enough UV protection. The UV protection of a garment can be impacted by elements such as the fabric type, colour, weight, and the usage of UV absorbers. Specifically, UV-resistant clothing can provide good protection from the sun's rays, but it's crucial to raise awareness of the value of wearing appropriate sun protection gear.

The study [26] recommended that people wear UV-protective clothes. Their research sought to ascertain the UV protection factor (UPF) of two T-shirt, cotton fabrics and investigate ways to raise their UPF. After testing several treatments on the fabrics, they discovered that dyeing the fabric or adding a UV-absorbing agent during laundering greatly reduced UV transmission and boosted UPF, while washing the materials with soap and water only modestly improved UPF.

The textile business has seen an increase in eco-fashion in recent years, with a focus on employing eco-friendly materials to safeguard human health and the environment. Clothes are an essential component of protection against the sun's UV radiation, which is a growing concern. The impact of clothing goods on the Solar Protection Factor is examined in this research [27]. The study [28]examined how ultraviolet (UV) photons, which make up a very minor portion of solar radiation, can have an impact on the functions of all living things. If someone is not protected, these rays can have a variety of impacts, ranging from minor tanning to major skin malignancies. Protection from the damaging effects of UV radiation can be obtained from clothes, sunscreen, and shade structures. UV-protective fabrics can be made by altering the fabric's design, employing the right light-absorbing materials, and applying the right finishing techniques.

2. Objectives

- To assess the availability of UV-protective clothing in the local markets of Chennai.
- To examine the clothing categories offered in UV-protective clothing in the Chennai market.
- To understand the type of fibres, their blends and fabric construction used in the UPF clothing available in Chennai.
- To study the garment design and body coverage in UV-protective clothing.
- To understand the price of UV-protective clothing in the Chennai market.

3. Materials and Method

The core aim of this research endeavour was to meticulously examine the prevalence and diversity of UV-protective clothing in the vibrant Chennai market. The study gave specific attention to both Indian and international brands, carefully handpicking a total of 80 brands using a convenient sampling technique to guarantee a comprehensive and inclusive representation. This deliberate selection process, which included 40 Indian and 40 international brands, was designed to capture the diverse landscape of UV-protective clothing offerings in Chennai, ensuring that all perspectives are considered and respected. Furthermore, the study methodically scrutinized six distinct clothing categories - casual wear, formal wear, semi-formal wear, party wear, sportswear, and athleisure - to provide an intricate and thorough analysis of the UV clothing market in Chennai.

4.1 Data Collection

Data collection entailed visiting carefully selected stores and methodically recording comprehensive details of UV clothing items within specific categories. Each item's features, such as fabric composition, UV protection level, available sizes, and colour options, were precisely documented to guarantee thorough and precise data collection.

4.2 Data Analysis

The data collected from various sources underwent a comprehensive descriptive analysis using elementary statistical methods. This involved a detailed examination of patterns and trends across different brands. Descriptive statistical measures, such as percentages and averages, were thoroughly applied to gain a thorough understanding of the quantitative distribution and provide a detailed insight into the collected data.

4. Results and Discussion

In alignment with the research objectives, the study sought to evaluate and understand the availability of UV-protective clothing and its retail panoramas in the Chennai market. The observations from Table 2 and Figure 1 discuss the availability of various clothing categories in different brands.

5.1 General clothing in the Chennai market:

Casual wear dominance: there is a predominant emphasis on casual wear, followed by athleisure, which suggests a trend in both Indian and international brands to prioritize comfortable clothing suitable for everyday use and various physical activities. Limited formal focus: The lower percentage in formal wear indicates that Indian brands may not place as much emphasis on formal occasions compared to other categories. Comfort: The notable representation of athleisure, along with sportswear, reflects a trend toward activewear that combines style with comfort, catering to active lifestyles. Understanding these trends helps in marketing strategies, product development and inventory planning for the brands.

5.1.1 Availability of UV Protective Clothing:

Table 2: Availability of UV-protective Clothing in India and International Brands Vs clothing category

CLOTHING CATEGORY	INDIAN BRANDS		INTERNATIONAL BRANDS	
	Availability of the category	Availability of the UV Clothing	Availability of the category	Availability of the UV Clothing
Casual Wear	47.22%	No	63.16%	Yes
Formal Wear	11.11%	No	5.26%	No
Semi-Formal Wear	22.86%	No	13.16%	No
Party Wear	25.71%	No	7.89%	No
Sports Wear	33.33%	No	21.05%	Yes
Athleisure	41.67%	Yes	47.37%	Yes

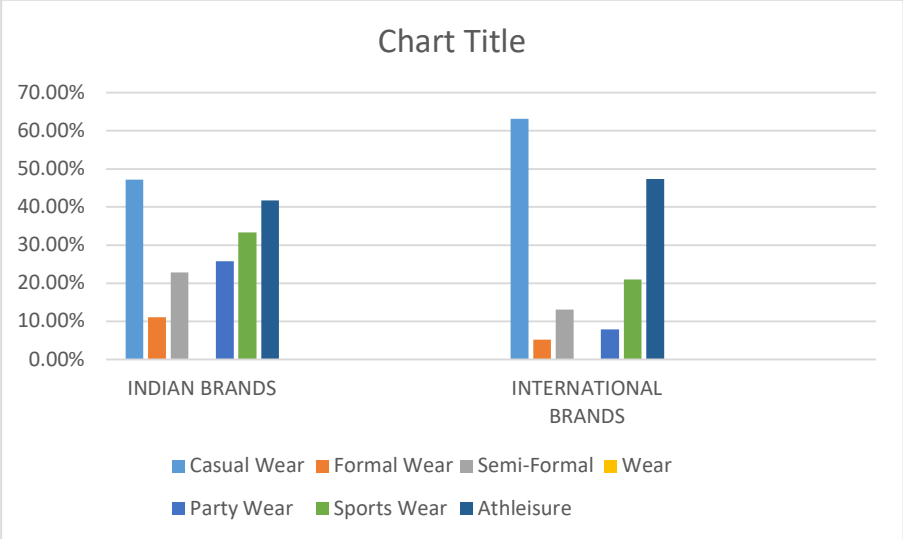

Figure 3: Clothing category –India vs. International brands

Among 40 Indian brands surveyed, only one Indian brand provides UV clothing such as T-shirts (short sleeve), Yoga pants, and sports bras, specifically in the athleisure category. According to Table 3, the products from Indian brands include T-shirts, yoga pants, and Sports bras. These products are made up of blends of bamboo-cotton fibres, renowned for their sustainability and softness. Knitted fabric is used for the garments. With a UPF of 50+, they provide efficient protection against the sun. Prices for the T-shirt, yoga pants and sports Bra as of February 2024 are rupees 750, 2000, and 729, respectively, offering ladies who are in search of reasonably priced, comfortable sun-protective clothing. However, it is observed that there are limited options in terms of style, price, and fabric.

Table 3: Details of UV-protective product from Indian Brand

ATTRIBUTES	DETAILS
Product	**T-Shirt, Yoga Pants, Sports Bra**
Demography	**Gender: Only Women** **Age: 16+ (Based on size – S)**
Fiber Type	**Blends (Bamboo-Cotton)**
Fabric type	**Knitted**
UPF	**50+**
UV Finish	**Not specified**
Price (as on Feb.2024)	**T-Shirt (Short sleeve) - ₹750 Yoga Pants - ₹2000/-** **Sports Bra - ₹729**

In contrast, 24 out of the 40 international brands offer UV clothing, spanning casual wear, sportswear, and athleisure categories. Table 4 below clearly shows that international brands have used synthetic fibres to manufacture their products. Only a few brands provided both recycled synthetic fibre and regenerated fibre blends, which could consider diversifying their fibre choices by incorporating more natural and regenerated fibre options. This not only aligns with sustainability goals but also caters to the growing demand for eco-friendly products.

Table 4: Attribute percentage of International brands that provide UV-protective clothing

ATTRIBUTES	DETAILS
FIBER TYPE	
Natural fibre	**0%**
Synthetic fiber	**100%**
Regenerated fiber	**8%**
Recycled Nylon/Polyester	**8%**
FABRIC TYPE	

Woven	**0%**
Knitted	**100%**
UV FINISH	
Chemical finishes	**Not specified**
Natural Finishes	**Not specified**

It is inferred that exploring sustainable options within knitted fabrics, such as natural or regenerated fibres or recycled materials, can be a strategic move for Indian brands to align with global preferences and environmentally conscious consumers. Brands should provide clear and transparent information regarding the nature of surface treatments applied to their fabrics. This transparency can foster consumer trust and contribute to sustainability initiatives and an eco-conscious consumer base. There is clear potential for the diversification of fibre types, especially towards more sustainable options, and the adoption of knitted fabrics in the Indian market. Hence, to understand the patterns as well as market trends, a systematic analysis of the data was conducted.

UV-protective clothing is available in different categories, including men's, women's, children's clothing, and unisex clothing. The majority of women's clothing that provides UV protection is made up of t-shirts (58.30%) and Pants/Leggings (45.80%); other options include tunics (29.20%) and skirts (20.80%). There is a significant availability of t-shirts (54.20%) and Pants/Leggings (37.50%) in men's apparel. T-shirts (25%) and pants/shorts (20.80%) are the most common clothing items for children. UV protection from unisex apparel is consistently provided at a rate of 20.80% in all categories, indicating a wide variety of choices for all ages and genders. However, during the study, other products were found, such as body suits for girls in the swimwear category. Two brands offered only hats and caps as UV protective accessories. These brands did not offer any other type of apparel.

Table 5: Availability of types of clothing in UV protective apparel

	Type of Clothing	**Availability**
WOMEN'S WEAR	**Top**	**20.80%**
	Tunic	**29.20%**
	Maxi Dress	**16.70%**
	T-Shirt	**58.30%**
	Skirt	**20.80%**
	Trousers/Pants	**45.80%**
MEN'S WEAR	**Shirt**	**16.70%**
	T-Shirt	**54.20%**
	Trousers/Pants	**37.50%**
KID'S WEAR	**T-Shirt**	**25%**
	Trousers/Pants	**20.80%**
	Shorts	**20.80%**
UNISEX CLOTHING		**20.80%**

5.1.2 Availability of UV clothing for women in International brands:

Brands cater to various types of clothing categories for sun protection. Table 6 provides information on the brands that offer UV-protective clothing for women, men, unisex clothing, and kids clothing, as well as whether the brand caters to all of them. Significant observations about the availability of women's UV-protective clothing can be seen in Table 5. The T-shirt category is notably available, with a significant 62.5% of all UV-protective products. This makes it a desirable choice for anyone looking for sun-safe clothing. Another interesting trend is that 33.33% of tunics provide UV protection. Additionally, the analysis shows in Table 6 that trousers are distributed fairly, with 45.83% of them having UV protection. However, the availability of apparel such as women's tops, maxi dresses, and skirts is comparatively less. These results provide important information to manufacturers, designers, etc., by highlighting the prevalence of UV-protective clothing in particular women's apparel categories.

Table 6: Availability of clothing variety in women's wear in International brands

Category	Percentage
Women's Top	4.17%
Women's Tunic	33.33%
Maxi Dress	16.67%
T-Shirt	62.5%
Skirts	25%
Trousers	45.83%
Head and Neck Cover	0%
Hand Cover up to wrist and beyond	12.5%
Face Cover	0%
Full Leg Cover (up to ankle)	0%
Full Leg Cover (up to midi length)	4.17%
Body Snugly Fitting Garment	91.67%
Loose Fit Garment	8.33%

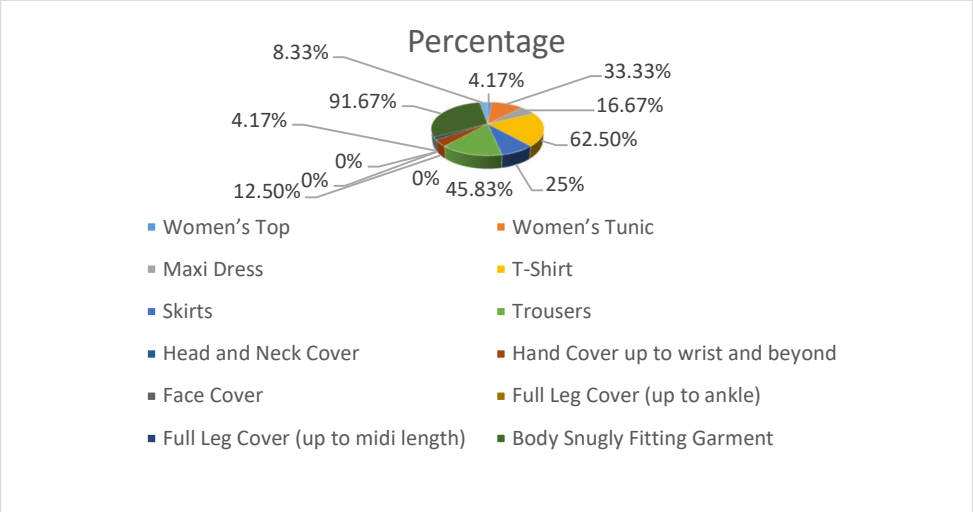

Figure 4: Clothing varieties in women's wear

Body Coverage: Notable findings arise when investigating body coverage and fit for UV-protective apparel. It is observed that none of the products offer head and neck coverage for women. However, 12.5% of the products cover the hands up to the wrist or more, indicating that hand protection is taken into consideration. There is not a single face cover in the brand. Only a small number (4.17%) of the products provide leg coverage up to midi length, and none of the products fully cover the legs up to the ankle.

Fit: The majority of the apparel (91.67%) are snugly-fitting clothes, highlighting the inclination towards body-fitted UV-protective apparel. On the other hand, a lower percentage (8.33%) of the products have a loose fit, appealing to people who prefer a more laid-back fashion sense. This thorough research helps consumers make educated decisions based on their preferences for coverage and fit by offering insightful information about the particular characteristics of UV- UV-protective apparel for women.

5.1.3 Availability of UV clothing for Men in International brands:

Table 7 provides a few details about men's UV-protective apparel options. T-shirts (66.67%) and trousers (50.00%) are readily available, making them good choices for individuals seeking sun-protective clothing. A Men's hooded sweatshirt is also offered, although to a lesser extent (16.67%). However, there are no men's shirts available.

Table 7: Availability of clothing variety in Men's wear

Category	Percentage
Men's Shirt	0%
Men's Trousers	50.00%
Men's T-shirt	66.67%
Men's Hoodie Sweatshirt	16.67%
Head and Neck Cover	20.83%
Hand Cover (up to the wrist and beyond)	8.33%
Face Cover	0.00%
Leg Cover (up to knee)	0.00%
Full Leg Cover	45.83%
Body Snugly Fitting Garment	41.67%
Loose Fit Garment	58.33%

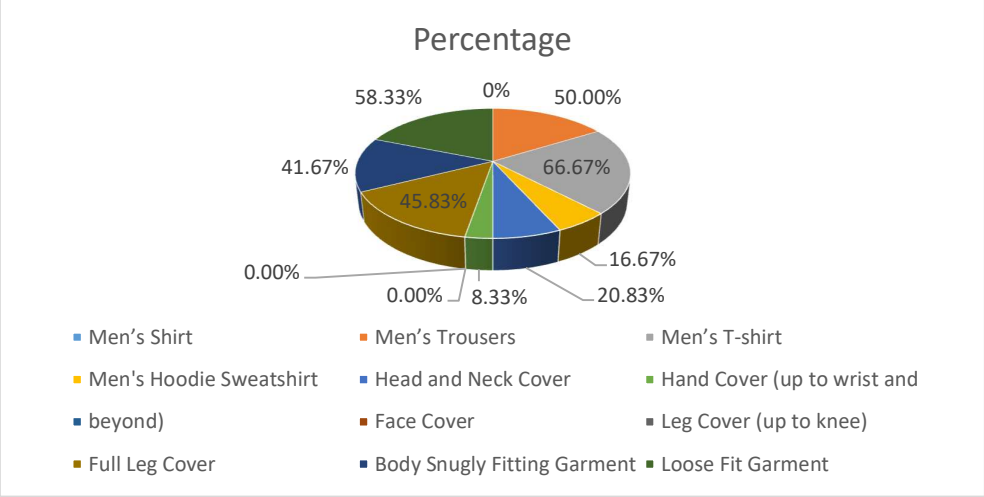

Figure 5: Availability of clothing variety in Men's wear

Notably, 20.83% of the UV clothing covers the head and neck, and 8.33% covers the hands up to the wrists and beyond. Interestingly, not a single garment has a face covering, and there is no knee-length leg covering included. Still, a sizable 45.83% of the apparel covers the whole leg. In terms of fit, 41.67% of the products are clothes that fit tightly, while 58.33% are clothes that fit loosely. The availability of UV-protective clothing for men is clarified by this thorough research, which takes into account both clothing types and body covering qualities.

5.1.4 Availability of UV protection clothing for Kids in International brands:

Data on the availability of UV-protective clothing for boys (up to age 12) varies by product category, as discussed in Table 8. T-shirts stand out at 41.67%, while shorts and trousers show somewhat lower but similar percentages, with 29.17% of the brands providing UV-protective clothing. This indicates that children have a considerable choice for UV-protective apparel.

Furthermore, UV-protective clothing for girls reveals differing levels of availability in various categories. T-shirts with short sleeves are available at 41.67%. Swimwear comes in second, with 31% availability. Conversely, bottom wear for girls only has 1% availability.

Table 8: Availability of UV protection clothing for kids

Product Category	Availability
Boys' T-Shirts	41.67%
Boys' Shorts	29.17%
Boys' Trousers	29.17%
Girls' T-Shirts	41.67%
Girls' Swimwear	31.00%
Girls' Bottom Wear	1.00%

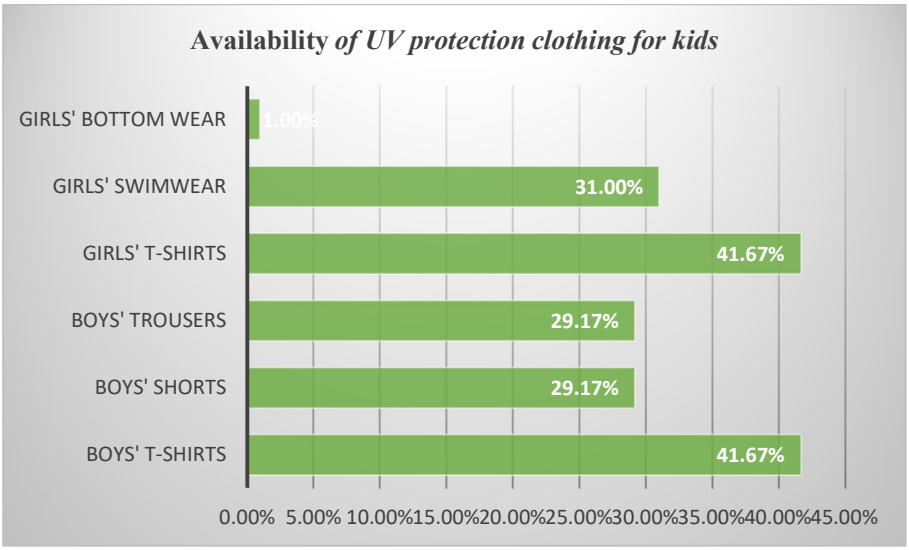

Figure 6: Availability of UV protection clothing for kids

According to Table 9, UV-protective clothing for girls is overwhelmingly available in body-fitting styles, accounting for 100% of the articles analyzed. There is variation in the coverage provided by these clothes, with 8.33% covering the head and neck and 4.17% covering the face. However, there are noticeably few options for hand and leg covers. This indicates a possible area for development and emphasizes the need for more varied choices to improve all-around sun protection for girls.

Table 9: Availability of clothing variety for Girls in International brands

Body Coverage and Fit for Girls	
CATEGORY	PERCENTAGE
Hand and Neck Cover	8.33%
Hand cover up to wrist	0%
Face cover	4.17%
Leg cover (Up to Knee))	0%
Full Leg cover	0%
Body Snugly Fitting Garment	100%
Loose Fit garment	0%

According to Table 10, there is a noticeable emphasis on body coverage in boys' UV-protective apparel. 50% of the clothing provides complete leg cover, and 16.6% of items offer coverage up to the thigh. Face coverage is 4.17%, while hand and neck coverage are quite low at 8.33%. Furthermore, 91.67% of the clothing items are of a loose-fit style.

Table 10: Body Coverage and Fit-Boys

CATEGORY	PERCENTAGE
Hand and Neck Cover	8.33%

Hand cover up to wrist	**0%**
Face cover	**4.17%**
Leg Cover (Up to thigh)	**16.6%**
Leg cover (Up to Knee))	**0%**
Full Leg cover	**50%**
Body Snugly Fitting Garment	**8.33%**
Loose Fit garment	**91.67%**

5.1.5 Price of UV-protective clothing

We explored information concerning the prices of various UV-protective products available in international brands, which is represented in Table 11 and Figure 7.

Table 11: UV protective products and their price range

Products	Price (in Indian Rupees ₹)
Yoga pants	**2000**
Fishing Pants	**19750**
Track Pants	**28364**
Shorts	**1799**
Skirts	**24000**
T-Shirts	**17156**
Sweatshirts	**18000**
Swimwear	**17999**
Hats	**8450**
Caps	**6250**
Only Sleeves	**14000**

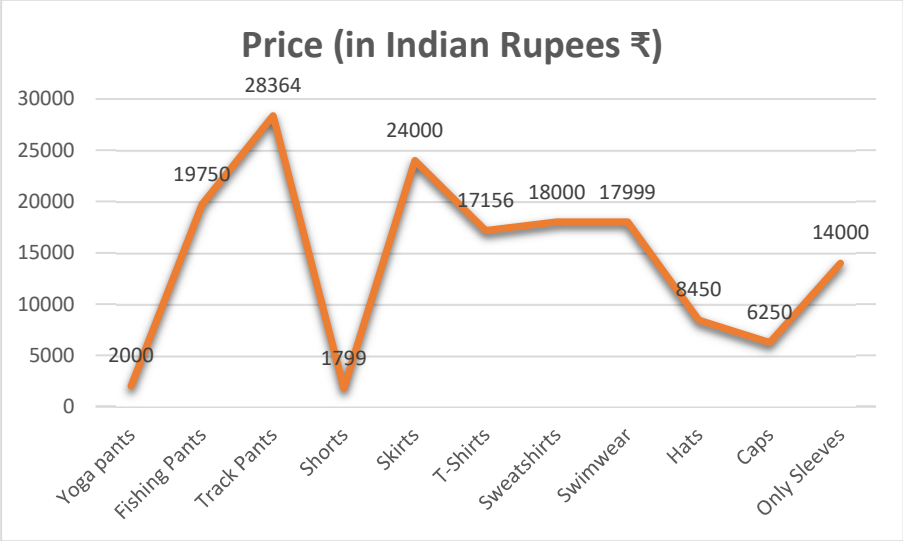

Figure 7: Price of the UV-protective products available in International brands

Bottom wear: The pricing for bottom wear is positioned at the higher end, with Track pants being the most expensive at Rs.28 364 and even the more casual shorts priced at Rs.1 799.

Top wear: Top wear items also reflect a premium pricing strategy, with T-shirts, sweatshirts and Swimwear all positioned as higher-end products.

Accessories: the accessory prices also maintain a premium positioning, with "only sleeves" (gloves that cover above the elbow) priced at Rs. 14,000/-, Hats at Rs 8,450/-, and Caps at Rs 6,250/-. Overall, the product range does not target all consumer segments. This positioning suggests a focus on delivering high-end UV protection

products.

5.1.6 Factors Influencing High Prices:

- Techniques used for coating chemicals on fabric surfaces for UV protection include dip coating, spray coating, pad dry cure method, sol-gel coating methods, electrostatic deposition, vapor deposition and layer-by-layer assembly using Nano/Plasma technology.
- Continuous advances in these techniques and technologies contribute to potential price increases in UV-protective products.
- Some brands provide additional properties along with UV protection, such as advanced antimicrobial properties or moisture-wicking capabilities, which contribute to overall costs.
- Outdoor enthusiasts, athletes, and individuals engaged in outdoor activities who prioritize effective sun protection or anyone who is conscious of harmful UV radiation and is willing to invest in specialized and high-quality products.

Conclusion

This study has provided a detailed insight into the availability of UV-protective clothing in the Chennai market. The following observations are predominant from the market study: the clothing market in Chennai primarily focuses on casual wear and athleisure, indicating a preference for comfortable everyday clothing. There is a limited availability of formal and semi-formal wear in Indian brands, suggesting less emphasis on UV clothing for formal occasions. Athleisure and sportswear options are more prevalent, reflecting a trend towards functional UV clothing. Among the 80 brands studied, only one Indian brand offers UV clothing, while 24 international brands provide UV clothing across various categories. Synthetic fibres dominate UV-protective clothing manufacturing, with the potential for diversification into natural and regenerated options. Knitted fabrics are predominantly used in fabric construction for UV-protective clothing, aligning with global preferences. UV-protective clothing from international brands is priced highly, ranging from Rs.4750/- to Rs30,000/-, indicating a premium classification. T-shirts, trousers and hooded sweatshirts are the most commonly available types of clothing, with some brands specializing in hats, caps, and arm sleeves. Few brands offer loose-fitted full-coverage products, with some providing body suits for Swimwear made from UPF-graded fabrics, albeit with exposed body parts other than the torso. In summary, the study provides valuable insights into the availability, characteristics and market positioning of UV-protective clothing in Chennai. Brands may benefit from adapting to consumer preferences, diversifying fibre choices, and enhancing transparency to meet the growing demand for sustainable and effective UV-protective clothing.

Limitations: This research is limited to analyzing the Chennai market alone. This provides accurate information regarding availability in Chennai, India. However, a broader market coverage would indicate a more comprehensive knowledge.

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