

# Study to determine the level of knowledge, the practices followed and the attitudes of the general population towards UV radiation, Uttar Pradesh, India

## Authors-

1. **Bhawna Solanki**, Assistant Professor, ERA university, Lucknow , U.P
2. **Neelam Rao Bharti** Assistant Professor, Quantum university ,roorkee
3. **Tanika chaturvedi** ,Assistant professor, Noida International University, Greater Noida UP
4. **Ajaydeep singh** , Assistant Professor, ERA university, Lucknow , U.P
5. **Maruf Ahmad** , Assistant professor, Noida International University, Greater Noida UP

## ABSTRACT

**Background:** Cumulative sun exposure will eventually cause different negative effects on humans including hyperpigmentation, skin cancer, cataract formation in the eye and skin burns, just to mention a few. Many international surveys have been done to assess the KAP of people towards UV radiation exposure and its harmful effects. However, there are scarce data on the general public.

**Objectives:** This study aimed to assess the knowledge, attitude and practices towards UV radiation amongst the general population.

**Method:** A survey using a questionnaire was conducted on a random sample of the general population across many different regions of the world.

**Results:** Ninety-five respondents had submitted their responses at the end of the data collection period. Sixty respondents were female and thirty-five were male. There was no relationship between gender and educational level. Undergraduates and postgraduates were more likely to have adequate knowledge about UV radiation and its harmful effects. The prevalence of awareness of the harmful effects of UV radiation was 72.6%. Meanwhile, adherence to sun protection measures was reported in 25.3% of the responses. The results also showed that 44.2% do not use sunscreen and 27.4% use it to prevent tanning. 72.6% do not know about the Fitzpatrick skin type scale and its importance but are willing to know about it and 68.4% showed interest in further information about UV radiation hazards.

**Conclusion:** This study has shown that the general population has basic knowledge about UV radiation and its hazards and that they have relatively good practices and a positive attitude towards UV radiation exposure. However, there is a need for interventional strategies for further awareness on the topic.

**Keywords:** *Ultraviolet radiation, protection measures, knowledge, attitudes, practices, UV index*

## 1.0 INTRODUCTION

The different non-ionizing radiations emitted by the sun include infrared radiation, visible light and also ultraviolet radiation. The UVR is classified into three subtypes according to their wavelengths; UVC 100 to 280nm, UVB 280 to 315nm and UVA 320 to 400 nm. Some UVR is insufficiently absorbed by the clouds and distributed into the atmosphere. The ozone layer absorbs UVB and UVC. UVR is widely known as a contributing factor in the production of vitamin D which helps the body retain minerals critical in keeping bones strong and healthy. It is also useful in protecting the body from the effects of multiple sclerosis, juvenile diabetes, a variety of infections and some cancers. UVR can suppress the clinical symptoms of these conditions. Cosmetic tanning, heliotherapy, phototherapy and UV-induced nitrogen oxide which improve cardiovascular health are also positive effects of UV radiation. UVR is a classical method of treating different kinds of diseases.

Long term exposure to the UVR emitted by the sun on different occasions can result in abnormal changes and growth of skin cells and ultimately cause acute skin damage like sunburn and tanning. In addition to this, more persistent skin problems can occur after long term exposure such as hyperpigmentation, skin ageing and skin cancers. There is undeniable proof that sun exposure is the cause of all three main types of skin carcinoma. The intensity of exposure depends on the various exposed body parts. Currently, approximately 2 to 3 million cases of non-melanoma cancers and 1, 32,000 melanoma skin cancers occur worldwide. Due to ozone layer depletion, the UVR that is reaching the Earth increases due to a significant decrease in filtering properties of the atmosphere. There has been a dramatic increase in the number of skin cancers and these numbers are an outcome of excessive sun exposure which depends highly on individual knowledge, attitudes and practices towards exposure to UVR.

These negative effects of ultraviolet radiation can be avoided by the use of different types of sun-protection practices. Some recommended practices by cancer agencies are wearing protective clothing, using sunscreen with an appropriate sun protection factor (SPF), wearing a hat, and avoiding the sun between 10 a.m and 4 p.m. Sunscreens are a highly recommended sun protection tool as they block the amount of UVR reaching the skin squamous cells through their attenuating characteristics, with attenuating power directly proportional to SPF. Adult females are more likely to know and frequently use sunscreens for protection.

There is a suspicion of a close link between UVB exposure and the formation of cataracts in the eye, but the evidence is circumstantial. The exposed cornea is prone to damage after exposure to UV radiation. Beyond this, other parts of the eye can be affected too. UV-blocking contact lenses can be used for protection against harmful UVR to the eyes.

Several researchers have analysed people's knowledge, practices and attitudes towards UVR hazards and changes of the same. However, most of these are targeted at a specific set of people like cosmetology students, athletes and beachgoers. Many people amongst the general population do not protect themselves from UVR and are misinformed about this issue.

To ensure maximum effectiveness of the protective practices towards UVR hazards, individuals should know their respective skin types and implement safety measures accordingly. According to the World Health Organisation (WHO), skin types can be classified into six categories: Skin Type I characterised by very fair skin to skin Type V and VI in natural brown and black people. WHO also states that people with skin type I and II are prone to sunburns while Type V and VI do not get sunburns as their melanin absorbs the UVR and tend to increase their risk of being affected by the UVR whereas Type III and IV are intermediate. Fair skin is a risk factor for UVR damage.

Making people aware of the UV index helps to warn them about the extent to which harmful effects of radiation are present on a particular day. This helps to plan and implement protection measures in line with the data reported.

### 1.1. NEED FOR STUDY

There is a very close link between skin types and the amount of damage that can be done by UV radiation exposure although all skin types are prone to damage after prolonged exposure.

Poor knowledge, attitudes and practices towards UV radiation exposure, keeping skin types in mind, can lead to chronic skin conditions including skin cancer.

### 1.2. STATEMENT OF THE RESEARCH PROBLEM

The recent years have seen a great rise in ozone layer depletion and hence a loss of the protective properties of the ozone layer. UV radiation that reaches the Earth's surface greatly depends on this protection, so a loss of the protective function of the ozone layer results in excessive UV radiation exposure. Seeing that more and more UV radiation is reaching the earth, individuals of the general population must know about the harmful effects of this radiation and the practices they should follow to protect themselves. Many people have basic knowledge about the harmful effects of UV radiation and they also know the usefulness of sunscreens but very few amongst them follow the required steps for use of sunscreen and protection from UV radiation and its hazards.

There is also evidence that very fair people, with skin type I, are more likely to be affected by UV radiation and easily get sunburns owing to their lack of melanin. People with darker skin types, type V and VI absorb UV radiation and can stand longer UV radiation exposure periods without increasing their chances of getting skin cancer. Hence, the general population's knowledge, practices, and attitudes towards UV radiation should be assessed. For this reason, this research study is being performed.

### 1.3. AIM

This study aims to determine the level of knowledge, the practices followed and the attitudes of the general population towards UV radiation, Uttar Pradesh, India

### 1.4. OBJECTIVES

To determine the knowledge of the general population about UV radiation hazards. To evaluate the practices and attitudes of the general population towards the hazards of UV radiation. To assess the relationship between knowledge, practices and attitudes towards UV radiation hazards.

### 1.5. HYPOTHESIS

**H<sub>1</sub>** = There will be a significant correlation between knowledge, practices and attitudes among the general population towards UV radiation hazards.

**H<sub>0</sub>** = There will be no significant correlation between knowledge, practices and attitudes among the general population towards UV radiation hazards.

### 1.6. OPERATIONAL DEFINITIONS.

**Sun-protection:** measures taken to prevent damages caused by the sun.

**Hazards:** the potential risks or harm that are posed by UV radiation exposure to humans.

**Knowledge:** how much the population knows about UV radiation and its hazards?

**UV radiation exposure:** the degree to which body parts are revealed directly to the sun.

**Practices:** measures that can be followed to avoid UV radiation exposure.

**Skin type:** a numerical classification for human skin colour ranging from I to VI

**Attitude:** the population's feelings or thoughts towards UV radiation hazards.

**Skin cancer:** abnormal growth of skin cells most commonly caused by excessive sun exposure.

**UV index:** a measure of how harmful the UV radiation is on a particular day.

**Tanning:** the act of making the skin darker either naturally by sunbathing or artificially using tanning beds.

**SPF:** sun protection factor; is a measure of how much a sunscreen product will protect from UV radiation, the higher the SPF the better the protection.

### **3.0 METHODOLOGY**

#### **3.1 DATA COLLECTION**

The survey was conducted amongst both males and females in different parts of the world. The questionnaire was inclusive. Data was collected through an online-based questionnaire in the month of May. Six questions were integrated into the first section about personal information, such as age, gender, skin type and nationality. The second section of the questionnaire comprised 15 questions about the participant's knowledge about UV radiation and its harmful effects. The third section focused on the sun protection practices of participants. The fourth and final section of the questionnaire is the attitude of participants toward sunscreen use, and the most important source of information regarding sun exposure effects. A total of 95 Google forms were completed.

#### **3.2 DATA ANALYSIS**

Data collected were analysed using SPSS software and MS Excel. The chi-squared test was used to determine the relationship between different variables. The statistical level of significance was defined as a  $p$ -value  $< 0.05$ .

#### **4.0 RESULTS**

The questionnaire was distributed randomly through email and other social media platforms. In total, 95 people responded and submitted the forms of which 36.8% were male and 63.2% were females. Their age range of the respondents was diversified with the most frequency between 18-24 (42.1%).

A summary of the demographic data collected is depicted in [Table 1](#) below.

<b>Gender</b>	<b>FREQ</b>
Female	60
Male	35
<b>Grand Total</b>	<b>95</b>

<b>Education level</b>	<b>FREQ</b>
Postgraduate	39
Secondary school	3
Some college education	9
Undergraduate	43
Uneducated	1
<b>Grand Total</b>	<b>95</b>

<b>Age</b>	<b>Frequency</b>
Below 18	3(3.2%)
18-24	40(42.1%)
25-34	20(21.1%)
35-44	18(18.9%)

Above 45 14(14.7%)

**Grand total 95(100%)**

Employment status	Frequency
employed	39(41.1%)
unemployed	7(7.3%)
student	49(51.6%)
<b>Grand total</b>	<b>95(100%)</b>

Skin type	Frequency
Type I - White skin	3 (3.2%)
Type II - Fair skin	9 (9.5%)
Type III - Average	10 (10.5%)
Type IV - Light brown skin	26 (27.4%)
Type V - Brown skin	37 (33.7%)
Type VI - Naturally black skin	13 (15.8%)
<b>Grand total</b>	<b>95 (100%)</b>

[Table 1](#)

#### 4.1. UV Radiation knowledge and practices

The level of UV radiation knowledge and its harmful effects is summarised in [Table 2](#) below. This study indicated a very high rate of UV radiation exposure knowledge amongst the participants although most of them were not aware of the UV index and that it can be used when considering sun protection measures to follow. Most of the respondents were quite aware of the harmful effects of sun exposure and the recommended sun protection practices. [Table 3](#) shows the participants' perception of the relationship between UV radiation exposure and the different harmful effects and also their perception of sunscreen. The majority of the respondents (43.1%) prefer using sunscreen as a sun protection measure to the other measures. They reported that they follow these protection measures often.

#### What are the recommended practices to avoid UV radiation?

	FREQ
All of the above	72
All of the above excluding sunscreens	3
Avoiding the sun between 10 am and 4 pm	4
Face covers	1
Use of sunscreen	12
Use of umbrella	1
Wearing wide-brimmed hats	2

<b>Grand Total</b>	<b>95</b>
--------------------	-----------

<b>What damage does UV radiation exposure cause?</b>	
	<b>FREQ</b>
All of these	69
Cataract formation in the eye	1
None of the above	2
Skin ageing	1
Skin burns	6
Skin cancer	16
<b>Grand Total</b>	<b>95</b>

<b><u>Do you know about UV index?</u></b>	
	<b>Freq</b>
No	82
Yes	13
<b>Grand Total</b>	<b>95</b>

[Table 2](#)

#### **4.2. Sun protection measures and Attitude towards UV radiation**

As shown in Table 2 above, the majority of the respondents know about the harmful effects of sun exposure and the recommended measures. Table 3 also shows the different opinions on tanning. However, according to the data collected, 37.8% of the respondents reported that they only practice these measures sometimes and not very often. There were mixed feelings regarding the attitudes of the participants towards UV radiation exposure and its effects. 44.2% were convinced to change their sun protection practices and a total of 41 out of the 95 (43.1%) respondents reported that UV radiation protection is important to them, while 24 (25.2%) recorded that it is very important, 25(26.3%) that it is slightly important and only 5(5.2%) reported that it is not important at all. Regarding tanning which is a source of harmful UV radiation, 49 people were passive and have never really thought about it, 6 regarded it as a part of the summer beauty routine and 6 others thought it has no health effects. Nonetheless, 34 respondents were aware that it damages the skin and should not be done. [Table 3](#) shows a summary of the participants' opinions on tanning.

<b>What is your opinion on tanning?</b>	
	<b>FREQ</b>

Has no health effects	6
It damages the skin and should not be done	34

It is a summer beauty routine	6
Never really thought about it	49
<b>Grand Total</b>	<b>95</b>

Table 3

## 5.0. DISCUSSION

There is little information about the knowledge, practices and attitudes towards UV radiation amongst the general population. Most studies focus on people within a certain population, for example, beachgoers, females or people within a specific region like Saudi Arabia. Different regions have different weather conditions which affect peoples' perception of UV radiation. This is clearly shown by the statistics of this study. The majority of the respondents 45(47.4%) were Indian, 25(26.3%) were Zimbabwean while a few 8 (8.4%) were British. These are very different environments: Zimbabwe being in Sub-Saharan Africa, Britain in Europe and India in South Asia. Hence, there was a variation in responses.

The results of this study suggest a close relationship between education level and knowledge about UV radiation as indicated in Table 4. Out of the 72.6% of respondents who knew about the harmful effects of UV radiation, 62.5% were either undergraduate or postgraduate. However, 86.3% of the respondents have no idea about the UV radiation index. This shows that although most people have a general understanding of UV radiation and its negative effects on humans. In addition to this, 16.8% associated UV radiation exposure with skin cancer. This also supports the point that the general population knows about UV radiation and its dangers only to a certain extent. Generally, people know at least one harmful effect of UV radiation but there is need for implementing methods of raising awareness to the general public.

The respondents reported the use of sunscreen as their sun protection practice, followed by 12.6% who use umbrellas, 11.6% use covers and 10.5% use wide-brimmed hats. Unfortunately, the second-largest number, 22.1%, reported that they were not following any of the practices at all. The study pointed out that many people use sunglasses (56.8%). However, their reasons were not all for sun protection purposes as almost 18% wear them as an accessory.

Furthermore, 20% do not own a pair of sunglasses and 11.6% have sunglasses but do not wear them. The form responses show that most of the participants have a relatively good attitude towards UV radiation and its associated effects. 27.4% of the respondents feel the need to change their UV radiation protection practices, 44.2% slightly feel the need to change while only 28.4% do not feel the need to change their practices at all. This trend shows that with the right interventional methods put in place, there could be a positive change in their practices.

A total of 51.6% of the participants listed their reasons for non-compliance with protective measures as either not convenient or because they do not know what measures to take. Certainly, these statistics should spotlight an interest in this issue regarding future researches and awareness programs. Interventional strategies focusing on attitudes and behaviour are desirable for change. A good place to start would be through some educational programs and creating more related content on the internet. In this study, 51.6% acquired their knowledge from education programs and 30.5% from the internet. Hence the recommendation.

H<sub>0</sub> = EDUCATION AND KNOWLEDGE ABOUT EFFECTS OF UV RAYS ARE INDEPENDENT VARIABLES

OBSERVED (FO)	Postgraduate	Undergraduate	Secondary	Some college	Uneducated	GRAND TOTAL
CATARACT FORMAT	1	0	0	0	0	1
SKIN AGING	1	0	0	0	0	1
SKIN BURNS	5	0	0	1	0	6
SKIN CANCER	5	8	0	3	0	16
ALL OF THE ABOVE	27	35	3	3	1	69
NONE OF THE ABOVE	0	0	0	0	2	2
GRAND TOTAL	39	43	3	9	1	95

EXPECTED (Fe)	Postgraduate	Undergraduate	Secondary	Some college	Uneducated	GRAND TOTAL
CATARACT FORMAT	0.41052632	0.452631579	0.03157895	0.094736842	0.010526316	1
SKIN AGING	0.41052632	0.452631579	0.01052632	0.010526316	0.010526316	0.89474
SKIN BURNS	2.46315789	2.715789474	0.06315789	0.063157895	0.063157895	5.36842
SKIN CANCER	6.56842105	7.242105263	0.16842105	0.168421053	0.168421053	14.3158
ALL OF THE ABOVE	6.56842105	31.23157895	0.02293629	0.068808864	0.007645429	37.8994
NONE OF THE ABOVE	0.82105263	0.905263158	0.00022161	0.000221607	0.000221607	1.72698
GRAND TOTAL	17.2421053	43	0.29684211	0.405872576	0.260498615	61.2053

EXPECTED (Fe)	Postgraduate	Undergraduate	Secondary	Some college	Uneducated	GRAND TOTAL
CATARACT FORMAT	0.84642375	0.452631579	0.03157895	0.094736842	0.010526316	1.4359
SKIN AGING	0.84642375	0.452631579	0.01052632	0.010526316	0.010526316	1.33063
SKIN BURNS	2.61273054	2.715789474	0.06315789	13.89649123	0.063157895	19.3513
SKIN CANCER	0.3745108	0.079314565	0.16842105	47.60592105	0.168421053	48.3966
ALL OF THE ABOVE	63.553998	0.454699945	386.414241	124.8659103	128.8047469	704.094
NONE OF THE ABOVE	0.82105263	0.905263158	0.00022161	18046.00022	0.000221607	18047.7
GRAND TOTAL	27.456391	0	24.615991	181.9758971	2.099290618	236.148

### **5.1. STRENGTHS AND LIMITATIONS**

The respondents of the questionnaire were self-selecting. This means that no one participated unwillingly and therefore, the answers are more accurate. Also, the questionnaire was open to everyone without any exclusion criteria and this was useful in getting neutral responses from people from different walks of life.

However, the questionnaire consisted of closed questions and the respondents were not given a chance to give their exact feeling and also there was no freedom to select more than one option in instances where it would be quite useful. Future studies should focus on a larger population for a more accurate assessment.

### **5.2 CONCLUSION**

This survey showed a reasonable level of knowledge and frequency of protection practices amongst the general population. There is also a generally good attitude towards UV radiation and its harmful effects. Nevertheless, there is ample room for improvement. Healthcare professionals including radiographers should take it upon themselves to educate their friends and families about UV radiation and its possible harmful impact on human life, clearly highlighting what can be done to reduce the negative effects of UV radiation. Health practitioners can also advise their patients on the negative effects of UV radiation exposure and suggest ways of prevention and control and possibly look into vitamin D supplements. Implementation of online strategies and educational programs can be a good way to improve the knowledge, practices and attitudes of UV radiation and its harmful effects amongst the general population.

### **REFERENCES**

1. Insufficient sun exposure has become a real public health problem. [Alfredsson L, Armstrong BK, Butterfield DA, et al. Insufficient Sun Exposure Has Become a Real Public Health Problem. \*Int J Environ Res Public Health\*. 2020;17\(14\):5014. Published 2020 Jul 13. doi:10.3390/ijerph17145014](#)
2. The risks and benefits of sun exposure. [Hoel DG, Berwick M, de Gruijl FR, Holick MF. The risks and benefits of sun exposure 2016. \*Dermatoendocrinol\*. 2016;8\(1\):e1248325. Published 2016 Oct 19. doi:10.1080/19381980.2016.1248325](#)
3. Sun exposure, skin and vitamin D production: evaluation in a population of fishermen. [Coutinho RCS, Santos AFD, Costa JGD, Vanderlei AD. Sun exposure, skin lesions and vitamin D production: evaluation in a population of fishermen. \*An Bras Dermatol\*. 2019;94\(3\):279-286. Published 2019 Jul 29. doi:10.1590/abd1806-4841.20197201](#)
4. Knowledge, attitudes and practices of the general public towards sun exposure and protection: A national survey in Saudi Arabia. [AlGhamdi KM, AlAkhlabi AS, AlQahtani AZ. Knowledge, attitudes and practices of the general public toward sun exposure and protection: A national survey in Saudi Arabia. \*Saudi Pharm J\*. 2016;24\(6\):652-657. doi:10.1016/j.jsps.2015.04.002](#) Knowledge and attitude of the general population towards effects of sun exposure and use of sunscreens. [Agarwal SB, Godse K, Patil S, Nadkarni N. Knowledge and Attitude of General Population toward Effects of Sun Exposure and Use of Sunscreens. \*Indian J Dermatol\*. 2018;63\(4\):285-291. doi:10.4103/ijd.IJD\\_609\\_17](#)
5. Sun awareness and sun protection practices [Sultana N. Sun Awareness and Sun Protection Practices. \*Clin Cosmet Investig Dermatol\*. 2020;13:717-730. Published 2020 Sep 29. doi:10.2147/CCID.S265477](#)
6. Knowledge, attitudes and practices towards sun exposure and use of sun protection among non-medical, female, university students in Saudi Arabia; A cross-sectional study. [Almuqati RR, Alamri AS, Almuqati NR. Knowledge, attitude, and practices toward sun exposure and use of sun protection among non-medical, female, university students in Saudi Arabia: A cross-sectional study. \*Int J Womens Dermatol\*. 2019;5\(2\):105-109. Published 2019 Jan 23. doi:10.1016/j.ijwd.2018.11.005](#)
7. [Modenese A, Korpinen L, Gobba F. Solar Radiation Exposure and Outdoor Work: An Underestimated Occupational Risk. \*Int J Environ Res Public Health\*. 2018;15\(10\):2063. Published 2018 Sep 20. doi:10.3390/ijerph15102063](#)
8. [Heckman CJ, Liang K, Riley M. Awareness, understanding, use, and impact of the UV index: A systematic review of over two decades of international research. \*Prev Med\*. 2019;123:71-83. doi:10.1016/j.yjmed.2019.03.004](#)