

# Effect of Visible Range Electromagnetic Radiations (Colours) on Platelets in Thrombocytopenia in Dengue Fever

SAMINA T. Y.AZEEMI<sup>1</sup>, KHALID MAHMOOD<sup>2</sup>, RUBINA YOUSAF<sup>3</sup>

## ABSTRACT

The aim of this study was to investigate the effect of different wavelengths in the visible region on platelets (*in vitro*) in thrombocytopenia. Chromo therapy is a method of treatment that includes visible range electromagnetic radiations to improve healing. The effects of electromagnetic radiations on platelets were not well understood. Whole blood was irradiated using six (6) different wavelengths of visible region. The platelets in samples responded to Red Colour and results showed the inhibition of degradation of platelets was due to exposure of those samples to 644 nm radiation (red colour). It is therefore suggested that visible range electromagnetic radiation (644 nanometre) can be used for thrombocytopenia in dengue fever.

**Key words:** Thrombocytopenia, Dengue fever, Platelets, Chromo therapy

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## INTRODUCTION

As we know that the Platelets are anuclear cells derived from megakaryocytes. The size of platelets although is small, platelets carry out much important biological functions which include 'protein synthesis and protein modification'; they possess receptors on their surface for signal transduction<sup>1</sup>. With the era of microarray and proteomic technology, the understanding of functions has increased in recent years, including the research that platelets act as immune cells<sup>2</sup>. Studies on dengue infection have found *in vitro*, the viral antigen on the surface of platelets, immune-complex containing platelets on skin biopsy and an association between platelets and dengue virus<sup>3</sup>. In recent years dengue has become the most important mosquito borne viral disease affecting humans<sup>4</sup>. One of the clinical indication in dengue virus infection is dysfunction of platelets or thrombocytopenia.

Chromo therapy is one of the few therapeutic systems which induce vibrations directly in the body<sup>5</sup>. Previous Studies on Chromo therapy<sup>6,7</sup> have yielded encouraging and interesting results so here we study the effect of visible range electromagnetic radiations on thrombocytopenia in dengue fever.

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<sup>1</sup>Department of Physics, Government Degree College (w) Wapda Town, Lahore, Pakistan

<sup>2</sup>Department of Microbiology, Citi lab & Research centre, University of Lahore, Lahore, Pakistan

<sup>3</sup>Department of Gynaecology and Obstetrics, University of Lahore

Correspondence to Samina T Y Azeemi E-mail: saminatazayyen@yahoo.com

## MATERIALS AND METHODS

Samples were collected from 15 patients recently diagnosed from Dengue Fever and enrolled at Al-Khidmat Teaching Mansoor Hospital, Lahore and had not received any sort of treatment before. Out of these 4 samples were selected as their platelet count was between  $50 \times 10^9$  / litre and  $60 \times 10^9$  / litre, while the normal platelet count is between  $150.0 \times 10^9$  / litre to  $400.0 \times 10^9$  / litre measured with Sysmex KX-21N™.

Seven test tubes containing 0.5 ml of blood were prepared for the experiment. Five were wrapped with multipurpose cellophane filter sheets of purple, yellow, blue, green, red and orange colour (dominant wavelengths given in table 1). One unwrapped and 6 wrapped samples were exposed to 12 watt full spectrum incandescent light bulb from a distance of 0.66m for 8 hours under the same conditions. One sample was also kept in dark at room temperature which acted as a control. Then again, absorbance was measured to determine count of Platelets.

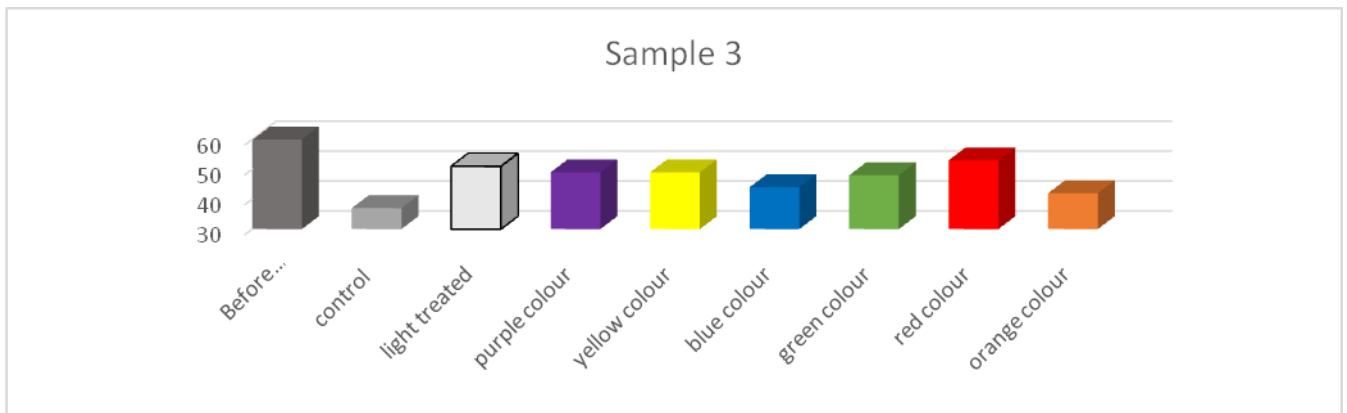
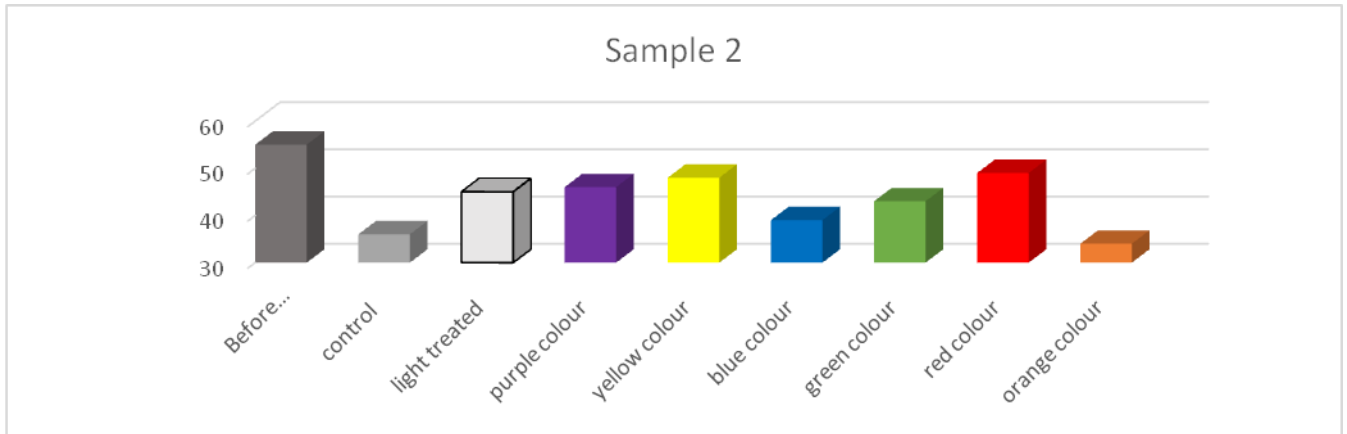
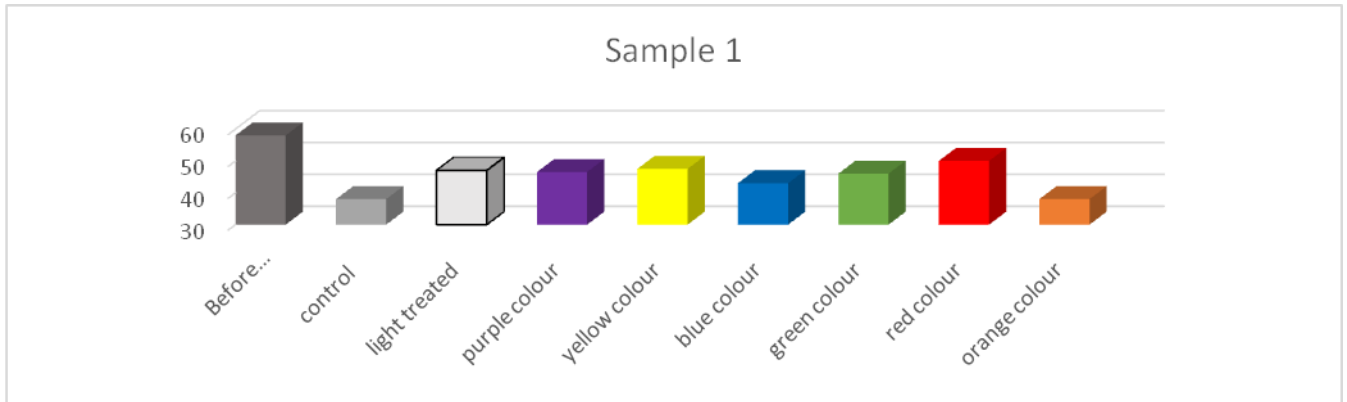
## RESULTS

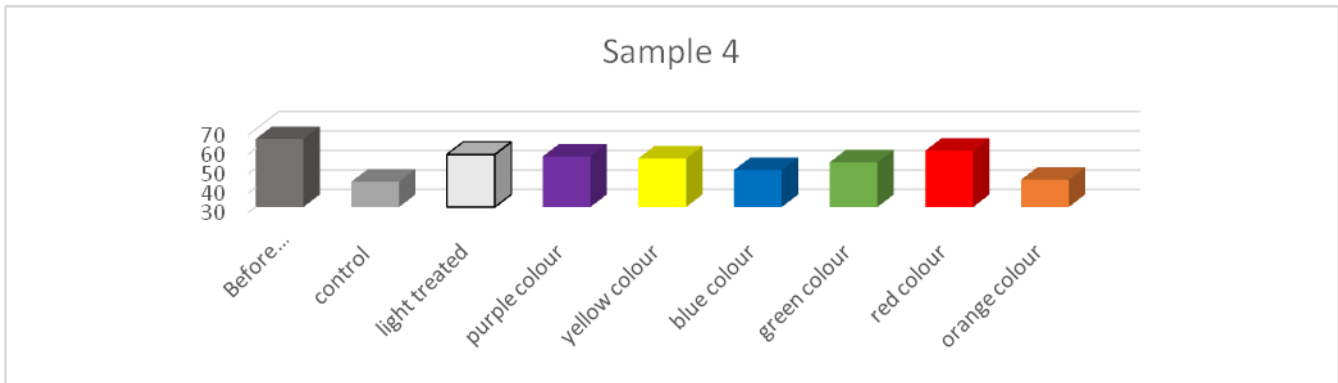
After application of different wavelengths, very interesting results were observed. Platelets responded differently to different visible range electromagnetic radiations (*in vitro*) (Graphs of Samples 1-4). As evident from the graphs, after 8 hours, samples showed inhibition of degradation of platelets when irradiated with 644 nm wavelength (red colour) as compared to control and other wavelengths (colours). These results are not due to the effect of heat as the rise in temperature was only 1°C which is quite negligible, also at this distance, the heat produced was almost equal to 1 joules/°C.

Table1. Dominant wavelength of monochromatic light measured by Hitachi U-2000 UV-Vis double beam spectrophotometer, spectral bandwidth 0.1nm and ordinates selected 10.

Color	Dominant Wavelength (nm)	Hue	Purity %	Transmission
Violet	400	Violet	48%	17%
Blue	453.5	Blue green	53%	53%
Purple	464	Violet	38%	31%
Green	538	Greenish Yellow	14%	36%
Yellow	590	Reddish Yellow	42%	81%
Orange	610	Orange	40%	48%
Red	644	Red	40%	51%

\*Handbook of colorimetry, Hardy, A.C, 1936, Technology Press, Boston, Mass.





## DISCUSSION

In this study, we aimed to understand whether there is an effect of different Colour wavelengths on thrombocytopenia and, if there is, what could be the wavelength that affects it. Scientifically, Chromo therapy is referred to as a narrow band in the cosmic electromagnetic energy spectrum, known as the visible colour spectrum. It is composed of blues, red and greens and also their combined hues, producing the perceivable colours that fall between the ultraviolet and the infra-red ranges of energy or vibrations<sup>5</sup>. Phototherapy is being used successfully to cure various pathological conditions like psoriasis, neonatal jaundice, leuko-derma and other skin diseases. The interaction of light with a biological object is of a purely photochemical nature. In cells, Photo bio modulation is known by its ability to induce photo-biological processes. The existence of a photo-acceptor suggests a relationship between these biological responses and the radiation wavelength. At molecular-cellular level there are photo-receptors, which activate a number of biological reactions when triggers: DNA/RNA synthesis, protein and collagen synthesis and cellular proliferation<sup>8</sup>. A previous study<sup>6</sup> shows that colours have a profound effect on parasites and cells. Effect of different wavelengths in the visible region on some important enzymes has also been studied<sup>7</sup>. When a particular frequency when provided to the platelets (*in vitro*) leads to the changes, there might be some also which are occurring *in vivo*. This suggests that by acting as promoters to platelets activity, specific wavelengths of light may regulate living processes. This is a report of an original idea of public health interest tested on few samples of platelets and as a result it is

suggested that 644 nm radiation (red Colour) may be used as the treatment of thrombocytopenia.

## CONCLUSION

- 644nm visible range electromagnetic radiation (Red Colour) may be used as the treatment of thrombocytopenia in dengue fever, as it is proved to be helpful for in inhibiting the degradation of platelets (*in vitro*).
- It can also be concluded that 644 nm (red colour) may increase the platelet count (*in vivo*).

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