



Available online through

www.jbsoweb.com

ISSN 2321 - 6328

Review Article

A REVIEW ON COLOURFUL MEHENDI: THE RISK OF PARAPHENYLENEDIAMINE

Arya Subhash ^{1*}, Chaitra H ²

¹PG Scholar, Department of Agada Tantra evumVidhiVaidhyaka, Sri Dharmasthala Manjunatheshwara College of Ayurveda and Hospital, Hassan, Karnataka, India

²Associate Professor, Department of Agada Tantra evum Vidhi Vaidhyaka, Sri Dharmasthala Manjunatheshwara College of Ayurveda and Hospital, Hassan, Karnataka, India

*Corresponding Author Email: dr.aryasubhash@gmail.com

Article Received on: 22/03/19 Accepted on: 12/05/19

DOI: 10.7897/2321-6328.072104

ABSTRACT

Mehndi or mehendi is a form of body art from ancient India. Here, decorative designs are created on a person's body, using a paste created from the powdered dry leaves of the henna plant. Henna plant is widely grown in almost all Indian homes as a hedge plant, for the use of them can be dated back since ages. Henna application can more be linked as a ceremonial art form. But recently, the addition of Paraphenylenediamine to mehendi for the purpose of commercialization has brought about serious health implications like contact dermatitis, bronchial asthma, throat irritation, convulsions, coma etc. As the trend of mehendi design application by cancer patients, women with alopecia and pregnant ladies over their bellies are increasing, a check to the addition of Paraphenylenediamine is the increasing need of the hour.

Keywords: Mehendi, Paraphenylenediamine, contact dermatitis, commercialization

INTRODUCTION

The word mehndi is derived from the Sanskrit word *mendhikā*¹ Ancient in origin, mehndi is still a popular form of body art among the women of the Indian subcontinent, Africa and the Middle East. It may be more considered as a ceremonial art form. The plant may be botanically identified as *Lawsonia inermis* of the family Lythraceae. The leaf of henna contains two colouring agents-naphthoquinone and a burgundy dye molecule, lawsone(2-hydroxy-1,4-naphthoquinone)², which are not known to cause any skin sensitization³. This dye molecule has the ability to bond with proteins thereby imparting the colour².

HISTORY

The plant *Lawsonia inermis* originated in Egypt and was carried regularly to India since at least 700 AD.

The use of mehndi and turmeric is described in the earliest Hindu Vedic ritual book for decorating women's and mens hands and feet, medicinal purposes etc. It was also used to dye cloth, skin, hair and fingernails, to dye silk, leather and wool, to colour the manes of horses and fur of other animals². Henna has been used to adorn women's bodies during marriage ceremonies and other social celebrations since the Bronze Age².

Main intention of use was to symbolically represent the outer and inner sun with the idea of 'awakening the inner light'¹.

The earliest use of this plant dates to the Pharaohs in Egypt, some 9,000 years ago. Cleopatra, the last reigning queen of the ancient Egyptian civilization is said to have used henna to adorn her body and beautify herself. Egyptians also used to paint nails of the mummies using henna before burying them⁴.

Henna application over the scalp provided benefits of hair strengthening, reduction of hair loss, anti-aging, anti-inflammatory properties, anti-pyretic effect, reducing sleep issues and regulating BP.

Despite the widespread use of natural henna, specially, in countries where henna art is traditionally practiced, reports of allergic contact dermatitis to natural henna are very rare in the literature. It can therefore be assumed that natural henna is a very weak skin allergen ².

PRESENT DAY SIGNIFICANCE

There are recent trends of application of mehendi designs by cancer patients ¹, and women with alopecia to decorate their scalps. This shows the importance of using mehendi without harmful chemicals. But the present trend and industrialization has led to addition of certain harmful chemicals to the mehndi available in the market. One such chemical is paraphenylenediamine.

There have been reported several cases of contact allergy from temporary tattoos, where patch tests showed a positive reaction to paraphenylenediamine. The onset of the dermatitis occurring a few weeks after the application of mehndi tattoo indicates the sensitization to paraphenylenediamine.

PARAPHENYLENEDIAMINE (PPD)

It is an organic compound with formula C₆H₄(NH₂)₂. It was first described by Hofmann in 1863 and formulated to use in hair dye at the end of 19th century⁵.

This is an aromatic derivative of aniline (C₆H₅NH₂) and is a dark white solid which darkens due to air oxidation into red and violet colors.

It is an ingredient of hair dyes and its use in temporary tattoos is associated with a risk of active sensitization. Being a contact allergen, it was voted as allergen of the year 2006 by the American Contact Dermatitis Society.

PPD requires a secondary ingredient such as a developer or oxidizer to produce the black color. It is within the epidermis or dermis that PPD is oxidized to an allergenic hapten⁵.

NEED OF ADDING PARAPHENYLENEDIAMINE TO HENNA

Recently paraphenylenediamine has been mixed with natural henna to give an ebony color (black henna) instead of the orange/reddish color given by natural henna².

PPD adding to henna can accelerate the process of dyeing while natural henna staining takes 4-12 hours, addition of PPD can reduce this time to an hour or two along with a long lasting effect), darkens, and give more precision to the design. Thus, a new pattern of exposure to PPD has been recognized through henna art which increases the risk of developing adverse health effects related to PPD².

Even though there have been documented cases of allergic contact dermatitis to PPD from the late 19th century, whereby it was prohibited from skin application by the Food, Drug and Cosmetics Act 1938, it still continues to be in use.

The wide popularity of PPD containing henna is because it gives a natural look and the hair can be shampooed without becoming discoloured.

SYMPTOMS

Symptoms can arise either due to short term or long-term exposure to high levels of PPD.

Short term exposure to high levels of PPD² can lead to:

- Severe dermatitis
- Eye irritation
- Tearing
- Bronchial asthma
- Gastritis
- Renal failure
- Vertigo
- Tremors
- Convulsions
- Throat irritation
- Sensitization dermatitis
- Long term exposure mainly leads to eczematous contact dermatitis.

FACTORS INCREASING THE RISK OF SKIN SENSITIZATION

- The long duration of skin contact.
- High concentration of sensitizing materials.
- Lack of a neutralizing agent.

CASES REPORTED

There are several cases reported over the sensitization to paraphenylenediamine. Some among them are as follows:

A 20-year-old woman with an itchy inflammatory edema strictly located at the site of a labile tattoo representing a Chinese pictogram, on the left deltoid area, which was applied by a transient artist who claimed to have used henna powder. As the tattoo was partially deleted, the patient had a second application 48 hours after the first one following which the reaction aroused (72 hours after the second application) She had also dyed her hair 2 months before which provoked itching and patchy eczema in the occipital region. The patch test performed with Finn-Chamber

technique revealed strong sensitization to paraphenylenediamine⁶.

A 25 year old male patient with an inflammatory edema on his left arm on the area of black tattoo applied 11 days previous, even though he had used permanent hair dye 3 times previously without any symptoms. The cutaneous lesions resolved with residual pigmentation with the use of topical betamethasone dipropionate. The patch test shows strong positive reaction to paraphenylenediamine⁶.

DISCUSSION

PPD is potentially capable of causing multiple toxic effects following skin contact. Contact allergy to PPD can manifest as acute, sub acute, or chronic dermatitis⁵.

The growing popularity of this trend among young people will possibly result in an increase of paraphenylenediamine sensitization⁷.

Using henna and related plant dye powders to dye hair is a process that requires more patience and knowledge than picking up a box of oxidative dye at the local store. This will yield permanent result without damage to hair and the body.

CONCLUSION

It is essential that consumers insist on only henna products of the highest quality and purity. This means products have to be tested for PPD, metallic salts, and other harmful adulterants and the ones containing them should not be used.

It is better recommended that the addition of PPD to henna should be prohibited. In addition, an awareness program should be established to inform the public about the risk of using henna mixed with PPD (black henna).

It is helpful to involve an experienced and well-trained hairdresser who uses proper techniques when applying hair dye. During hair dye self-application, it can be difficult to minimize spread onto the scalp. Recommended approaches for hairdressers to prevent hand dermatitis are proper education, appropriate use of gloves, and emollient use to prevent irritant hand eczema.

REFERENCES

1. "Mehndi." *Definitions.net*. STANDS4 LLC, 2019. Web. 10 May 2019. Available from: <https://www.definitions.net/definition/Mehndi>.
2. Ayesha Al-Suwaidi, Hafiz Ahmed. Determination of *para*-Phenylenediamine (PPD) in Henna in the United Arab Emirates. *International Journal Of Environmental Research and Public Health* [Internet]. 2010 April [cited 2019 Jan 26];7(4): 1681-1693. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2872353/>
3. Chong SJ, Park HJ, Oh ST, Lee JY, Cho BK. A Case of Allergic Contact Dermatitis due to Henna Tattooing. *KAMJE* [Internet]. 2005 March [Cited 2019 Jan 28];43(3): 1061-1062. Available from: <https://koreamed.org/article/0048KJD/2005.43.3.371>
4. The express tribune magazine (a brief history of henna-magazine) Iram Moazzam Published: August 4, 2014 <https://tribune.com.pk/story/741476/a-brief-history-of-henna/>
5. Krishna Sumanth Mukkanna, Natalie M Stone, John R Ingram. *Para*-phenylenediamine allergy: current perspectives on diagnosis and management. *Journal of Asthma and Allergy* [Internet]. 2017 Jan 18 [cited 2019 Jan 26];10: 9-15. Available from: <https://www.dovepress.com/para-phenylenediamine-allergy-current-perspectives-on-diagnosis-and-peer-reviewed-fulltext-article-JAA>

6. Christophe J. Le Coz, MD; Christine Lefebvre, MD; Fabienne Keller, MD; et al Édouard Grosshans, MD. Allergic Contact Dermatitis Caused by Skin Painting (Pseudo tattooing) With Black Henna, a Mixture of Henna and p-Phenylenediamine and Its Derivatives. *Arch Dermatol* [Internet]. 2000 December [cited 2019 Jan 28]; 136(12):1515-1517. doi:10.1001/archderm. 136.12. 1515. Available from: <https://jamanetwork.com/journals/jamadermatology/fullarticle/190890>
7. Antonella Tosti, Massimiliano Pazzaglia, Marina Bertazzoni. Contact Allergy from Temporary Tattoos. *Arch Dermatol*. 2000;136(8):1061-1062. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/10926749>

Cite this article as:

Arya Subhash and Chaitra H. A review on colourful mehendi – The risk of paraphenylenediamine. *J Biol Sci Opin* 2019;7(2):16-18.
<http://dx.doi.org/10.7897/2321-6328.072104>

Source of support: Nil; Conflict of interest: None Declared

Disclaimer: JBSO is solely owned by Moksha Publishing House - A non-profit publishing house, dedicated to publish quality research, while every effort has been taken to verify the accuracy of the contents published in our Journal. JBSO cannot accept any responsibility or liability for the site content and articles published. The views expressed in articles by our contributing authors are not necessarily those of JBSO editor or editorial board members.