Usage and Practice of Henna with synthetic dyes among Sudanese Women in Khartoum, Bahri, and Omdurman

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Abstract:

Objectives:

1. To screen and examine the utilization of henna, comparing natural henna (Lawsoniainermis) with synthetic dyes, such as black henna and Pegen in Sudanese who applied henna and henna artist.
2. To compare age, education, Marital Status and Children and type of dyes used among Sudanese who applied henna and henna artists with pathological effects of henna and Pegen.

Material and methods:

Study Design: Descriptive study.

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Study area & Duration: Khartoum – Sudan, 2010–2012.

Study population and sample size: 100 adult Sudanese women, comprising 50 henna artists and 50 housewives and female employees.

Data analysis: A data of closed questionnaire, randomly distributed, documented information about the type of henna used, frequency, and duration of exposure analysis was computer–based by statistical software SPSS (anova test).

Results:

44% and 24% of black henna users reported dermatitis and sinusitis, respectively. Additionally, 34% and 18% of Sudanese women using synthetic dye–infused henna complained of dermatitis and nephritis.

Conclusion and recommendation:

In this study some of Sudanese women who suffered from severe hypersensitivity to treated natural henna, showed skin sensitivity.

To avoid hair dyes problems Sudanese women should use pure henna that grows naturally to dye their hair or skin.

Sudanese women who applied henna mixed with PPD must make the PPD test before applying henna.

Keywords: Henna, PPD, hypersensitivity

خلاصة:

أهداف:

1. لفحص وفحص استخدام الحناء، مقارنة الحناء الطبيعية (Lawsoniainermis) مع الأصباغ الاصطناعية، مثل الحناء السوداء وبيجن في السودانيين الذين طبقوا الحناء وفنانة الحناء.

2. مقارنة العمر والتعليم والحالة الاجتماعية والأطفال ونوع الأصباغ المستخدمة بين السودانيين الذين طبقوا الحناء ورسامي الحناء ذوي التأثيرات المرضية للحناء والبجن.

المواد والطرق:

تصميم الدراسة: دراسة وصفية.

منطقة ومدة الدراسة: الخرطوم – السودان 2012-2010

مجتمع الدراسة وحجم العينة: 100 أمرأة سودانية بالغة، منهم 50فنانة حناء و 50 ربة منزل وموظفة.

تحليل البيانات: تم استخدام بيانات الاستبيان المغلق، الموزعة بشكل عشوائي، والمعلومات الموثقة حول نوع الحناء المستخدم، والتكرار، ومدة تحليل التعرض باستخدام الكمبيوتر باستخدام البرنامج الإحصائي (SPSSاختبار التباين).

نتائج:

أبلغ 44%و 24%من مستخدمي الحناء السوداء عن التهاب الجلد والتهاب الجيوب الأنفية، على التوالي. بالإضافة إلى ذلك، اشتكت 34% و 18%من النساء السودانيات اللاتي يستخدمن الحناء المصبوغة بالصبغة الاصطناعية من التهاب الجلد والتهاب الكلية.

الاستنتاجات والتوصيات:

في هذه الدراسة ظهرت حساسية جلدية لدى بعض النساء السودانيات اللاتي عانين من فرط حساسية شديدة تجاه الحناء الطبيعية المعالجة.

لتجنب مشاكل صبغات الشعر، يجب على المرأة السودانية استخدام الحناء النقية التي تنمو بشكل طبيعي لصبغ شعرها أو بشرتها.

يجب على النساء السودانيات اللاتي استخدمن الحناء الممزوجة بـــ PPDإجراء اختبار PPD قبل وضع الحناء.

Introduction:

The Lythraceae family embraces Henna, thriving in diverse climates from tropical to semi-arid zones across Africa, south Asia, and north Australia. Henna leaves,

stem bark, roots, flowers and seeds have been used in traditional medicine. The henna plant grows native to tropical and subtropical regions of Africa and Southern Asia. Saudi Arabia, Iran, Sri Lanka, India, Egypt and the Sudan are its major producers. (De Groot, 2013). Henna body art is done by putting henna paste on the skin. The henna paste is made by drying the henna leaves and crushing them to powder, and then this powder is combined with oil or water to form the paste. The henna paste is applied to the skin, the dye called lawsone present in henna leaves extract (Elmanfe,. et a. 2022).

There are three types of henna like Neutral henna, Red henna and Black henna. Neutral henna, a green powder that smells like freshly cut grass, is neither henna nor neutral. Neutral henna or Cassiaobovata does not stain hair. Red henna, a green powder that smells like hay. The leaves of the henna plant possess a red–orange stain molecule: lawsone, a naphthaquinone compound. Henna cause to dye your hair reddish; but this stain is

translucent and will combine with your natural color. Black henna, a green powder that smells like frozen peas, is neither black nor henna. Black henna is the combination of red henna and the dye PPD. When henna is a small and immature plant, it has low dye content and is spineless; when mature, it develops spines and higher dye content. Natural henna gives a brownish- orange pigment to the skin when applied (red henna), but the color will darken to brown. Different substances, such as lemon oil, vinegar, eucalyptus oil and coffee, may be added to obtain different coloring effects and a thick paste (Gg, L., Bener, A. and Pm, F. 1999). The pure henna is a weak sensitizer and it is poorly responsible for allergic contact dermatitis (Polat,. et al. (2009). Its chemical richness encompasses lawsone, phenolic derivatives, coumarins, xanthones, tannins, and flavonoids, making it a cultural mainstay in cosmetics historically (Varghese,. et al. 2010).

Henna has many therapeutic effects like anti-microbial, antioxidant, anti-cancer, and antiparasitic activity, skin

cancer chemopreventive activity, joint pain treatment, ulcers, and welding. Treatment of liver and digestive disorders reduced tissue loss in leprosy, diabetic foot disorders, ulcers, and diabetes mellitus treatment Nohynek (2005).

Paraphenylene diamine is a skin and body dye, and is used for coloring hair, palms; and forming temporary tattoos. PPD in its raw state is available as powder as well as in rock form (stone dye). PPD is a common component of commercial hair dyes, and, in Africa and Asia, it is also mixed with henna to form black henna. This darkens it's into a highly toxic and allergic compound. Acute allergic reactions following absorption from skin are well described (Tanweer, S. et al. 2018). Black Henna introduces complexities, combining red Henna and PPD. study connects PPD acylation to allergic reactions, highlighting PPDA as a potent allergen. Severe reactions to PPD in hair dyes are documented (Salvador, 2017). Paraphenylenediame (PPD), a derivative of paranitroaniline and a synthetic

hair dye, is extensively used internationally among various hair dyes. In hair dye formulations, PPD undergoes oxidation by oxygen resulting from the decomposition of hydrogen peroxide, yielding quinine diamine.

Toxicity studies over more than 50 years have led to European regulations restricting the concentration of PPD in hair dye formulations to 6%. Concentrations in formulations range from 0.20% in golden blond dyes to 3.7% in black hair dyes. Animal experiments have shown that the lethal dose of PPD is approximately 250 mg/kg body weight. In Sudan, the pure sample of dyes is approximately 97% PPD (Mohammed, 2000). The overarching objective of this study is to highlight the toxicity of synthetic dyes like black henna (stone dye) and pegen in comparison to natural henna. Despite generally safe use, Henna presents mild allergic reactions and hemolytic anemia risks, reported by (Saghi et al 2023). Awareness is crucial for safe application.

Materials and methods:

The study involved 100 adult Sudanese women, comprising 50 henna artists and 50 housewives and female employees. A closed questionnaire, randomly distributed, documented information about the type of henna used, frequency, and duration of exposure. The participants included individuals from governmental and private institutions, housewives, and henna artists (Hananat) at coiffeurs and beauty centers. The questionnaire adhered to professional ethics, recording symptoms of allergy and/or toxicity.

Study Design: Descriptive study.

Study area & Duration: Khartoum – Sudan, 2010–2012.

Study population and sample size: 100 adult Sudanese women

Data analysis: A data of closed questionnaire, randomly distributed, documented information about the type of henna used, frequency, and duration of

exposure analysis was computer-based by statistical software SPSS (ANOVA test).

Results:

Notably, 95% of henna artists and 70% of women used treated henna or black henna (mixed with stone dye or locally purchased Pegen) for skin and hair applications. The majority of henna artists, residing mainly in Omdurman, attended to 60% and 70% of Sudanese women for dying processes, respectively. Among the surveyed population, 58% of Sudanese women preferred black henna due to its cost-effectiveness, with only 12% opting for Pegen. However, 44% and 24% of black henna users reported dermatitis and sinusitis, respectively. Additionally, 34% and 18% of Sudanese women using synthetic dye-infused henna complained of dermatitis and nephritis.

In conclusion, the evolving awareness among Sudanese women concerning the physiological and toxic effects of black henna marks a positive step towards informed choices. The discernment to shift towards Pegen,

acknowledged for its comparatively lower toxicity, reflects a commendable effort in prioritizing health. However, it is imperative to address the oversight surrounding the gradual accumulation and precipitation effects of Pegen in tissues, potentially leading to severe dermatitis and acute renal failure.

Table (1) Education, Age, Marital Status and Children and type of dyes used among Sudanese who applied henna henna artists

				LOCATION						
		Khartoum		Bahri		Omdurman		Percentage %		Pvalue
Education status	Education status	Housewife							Artist	
	[illegible]	٢	٢	٧	3	٩	٩	22	20	.036
	[illegible]	٧	٧	9	7	01	13	48	50	.154
	Basic	3	٢	٩	3	9	٩	26	18	.007
	[illegible]	١	١	١	٢	٢	3		12	.352
Age	[illegible]	9	٩	12	8	١٤	١٤	60	56	.532
	[illegible]	٢	٧	٩	9	9	01	24	40	.169
	[illegible]	١	0.886	٢	١	٢	٢	8	٧	.117
Children	> 3	_	9	_	11	_	19	_	72	.322
	<3	_	١	_	٢	_	3	_	12	.141
	Only 3	_	٢	_	٢	_	٧	_	١٤	.063
Size of [illegible]	Simple	**6**	_	**11**	_	**18**	_	74	_	.755
	Dense	**3**	_	**4**	_	**8**	_	26	_	
Types of dyes used	Black henna	٢	٩	١	11	١	12		58	.005
	Pegen	3	3	9	9	8	7		30	.212
	[illegible]	٧	_	01	_		_		_	.003
	Natural henna	0	١	٢	٢		3		12	.061

Table (2) Period of application, Duration of PPD sign, Percentages of using hair dyes and Types of hair dyes used Sudanese women

Study area		LOCATION							
		Khartoum		Bahri		Omdurman		Percentage %	
		Housewif		Housewif		housewif		housewife	Artist
Period of application									
	>2 weeks	2		4		5		22	
	2 weeks	3		[redacted]		[redacted]		38	
	< 2 weeks	4		[redacted]		[redacted]		40	
Duration of PPD sign in the skin									
	[redacted] 15 days	6		11		12		[redacted]	
	5 months	3		[redacted]		[redacted]		35	
	1 years	0		1		2		5	
Percentages of using hair dyes									
	Synthetic dye	[redacted]		15		18		80	
	Natural henna	1		2		2		01	
	None	1		2		2		01	
Type of practicing period	Continuous Period	_	[redacted]	_	12	_	21	_	80
	Discontinuous period	_	2	_	3	_	5	_	20

Table (3):

Study area			LOCATION					
	Khartoum		Bahri		Omdurman		Percentage	
Sudanese women	Housewife	Artists	House wife	Artists	housewife	Artists	housewife	Artist
[illegible]	4	3	4	5	01	9	44	34
[illegible]	2	2	2	3	5	5	24	24
[illegible]	1	0	2	1		2	01	6
[illegible]	1	2	2	3	2	5		18
[illegible]	1	2	1	3	2	5	01	18
[illegible]	2	1	2	1	3	2	12	8

Table (4): Diseases among Sudanese women applying henna with synthetic dyes compared with henna artists Percentage of Sudanese women used come for dying daily and occasionally

Study area		LOCATION		
	Khartoum	Bahri	Omdurman	percentage
No of women used come for dying occasionally				
> 20	5	[illegible]	17	70
10 to 15	3	4	[illegible]	30
5 to 10	1	1	2	[illegible]
No of women used come for dying daily				
10 to 15	5	[illegible]	15	[illegible]
5 to 9	3	4	[illegible]	30
1 to 4	1	2	3	[illegible]
10 to 15	5	[illegible]	15	[illegible]

Discussion:

The results of this study leaded to significant effects may be due to that, the research was done among a sensitive group of Sudanese women who stayed at their houses to practice the job of temporary tattooing with henna mixed with hair dye for long period of time, also this group is practicing their job in their houses without any precautions and were not directed to follow any health instructions to protect them.

The study also involved the group of Sudanese women who suffered hypersensitivity of treated henna that observed in (70%) of the group this might be due to addition of urea or chemical pesticides to henna plant during cultivation to accelerate the growing of the plant whereas the rest group (30%) might developed sensitivity to the lawsone material.

Therefore the addition of chemicals as PPD or pesticides could exposed women to risk of renal failure and skin dermatitis.

Transdermal absorption of PPD during prolonged occupational exposure has been linked to interstitial fibrosis and chronic renal failure. While henna is a natural product and is seldom associated with adverse effects, PPD, a coal tar derivative, on oxidation is converted (Sampathkumar, K. and Yesudas, S. 2009).

Black henna tattoos will induce contact allergy to its ingredient PPD at an estimated frequency of 2.5% (De Groot, 2013).

A type IV hypersensitivity reaction to PPD was confirmed by the positive results attained by patch testing done with standard European battery and natural henna paste. Unfortunately, PPD–induced skin reactions can be grievous, leaving lasting changes to the skin. Therefore, proper diagnosis of contact dermatitis is required to provide a timely and adequate treatment as well as to avoid the cause in the future (Cunha, F. et al. 2022).

PPDA, identified as a potent allergen by (Salvador in 2017), is a common cause of allergic contact dermatitis

(ACD). Severe contact allergic reactions resulting from PPD in hair dyes, ranging from mild dermatitis to life-threatening events such as angioedema, bronchospasm, asthma, and renal impairment, were reported by (Gupta,. et al 2015).

In a study in UK, it was shown that 7% of adult and 14% of their children had a temporary tattoo (Hueber-Becker,.2004) PPD toxicities are reported usually after its ingestion; however, there are some cases of systemic toxicity after its local application as hair dye (Ashraf,. et al 1994).

Other studies reported, the primary symptoms of toxicity from body painting are massive edema of the face, lips, glottis, pharynx, neck, and bronchi, occurring within hours of application of the dye mix to the skin, and sometimes requiring emergency tracheostomy for respiratory obstruction. Ingestion of the mix or PPD alone, either accidentally (in children), deliberate (suicidal), or homicidal, leads to similar clinical presentations with, additionally, rhabdomyolysis. Many

patients die within 24 hours (Hueber–Becker et al 2007). The cumulative effects of prolonged lead exposure may be of concern, especially in children (Kang, I., and Lee, M. (2006). Topical application of henna may trigger severe hemolysis in children with G6PD deficiency. Signs and symptoms may include pallor, lethargy, vomiting, jaundice, anemia, tachycardia, poor peripheral perfusion, shock, and even mortality Miraj, S., & Kiani, S. (2016). Other study reported Cutaneous vasculitis with rapidly progressive glomerulonephritis has been described with chronic use of henna mixed with PPD for dyeing of the hair. Hair dressers who use henna have been shown to have a high occurrence of renal impairment due to regular exposure to PPD.77 Twelve patients ingested PPD (henna hair dye) in suicidal attempts with severe acute renal failure (Saif, F. A. 2016).Using black henna should be avoided since it contains PPD, which can be absorbed through the skin and affect the underlying nervous tissue (Alkandari, 2023).

In conclusion, the evolving awareness among Sudanese women concerning the physiological and toxic effects of black henna marks a positive step towards informed choices. The discernment to shift towards Pegen, acknowledged for its comparatively lower toxicity, reflects a commendable effort in prioritizing health. However, it is imperative to address the oversight surrounding the gradual accumulation and precipitation effects of Pegen in tissues, potentially leading to severe dermatitis and acute renal failure.

In light of increased awareness and education, Sudanese women are now knowledgeable about the physiological and toxic effects of black henna with a stone dye purity of 97%. Consequently, there is a notable shift towards the use of Pegen, recognized for its lower toxicity at 8% purity. HoweverThese initiatives should not only focus on the immediate effects but also emphasize the long-term consequences of henna usage, shedding light on the potential health impacts, a prevailing oversight regarding the gradual accumulation

and precipitation effects of Pegen in tissues, leading to severe dermatitis and acute renal failure. Furthermore, there is a heightened risk of PPD toxicity among female employees who use this type to save time.

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