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Renal complications of hair-straightening products; a public awareness

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Abstract
Systemic absorption of glycolic acid derivatives and formaldehyde causes acute renal failure after hair-straightening products. Oxalate is an end product of glyoxylic acid, which is a metabolite of glycolic acid. The dominant finding on kidney biopsy in the reported cases was acute oxalate nephropathy, which is caused by strengthened levels of oxalate that progress calcium oxalate precipitation in various tissues, comprising the renal tissue, developing toxic damage to the renal tubules and interstitium.
Keywords: Acute kidney injury, Glyoxylic acid, Kidney biopsy, Acute oxalate nephropathy, Glycolic acid, Hair-straightening products, Formaldehyde, Kidney injury
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Introduction

Hair-straightening products are extensively used by both women and men; however, many are unaware of their link to acute kidney injury (AKI) (1). Individuals with pre-existing kidney damage, diabetes, and high blood pressure are at a higher risk of developing AKI (2). The best way to prevent AKI is to avoid using hair-straightening products with high concentrations of harmful chemicals since hair-straightening products can contain high levels of formaldehyde, a chemical that can cause AKI (3). Formaldehyde is a colorless gas with a strong odor that is widely used by manufacturers as a preservative and is a known nephrotoxic agent (4). In some cases; however, the hair-straightening products were labeled as for hair-straightening products maldehyde-free, but they contained formaldehyde. Likewise, the hair-straightening products used in some cases were found to contain high levels of oxalate, which can cause acute oxalate nephropathy, a type of AKI (5). In this study, we explore the causes of acute renal failure attributed to hair-straightening products.

Search strategy

For this review, we conducted a search across several databases, including PubMed, Web of Science, EBSCO, Scopus, Google Scholar, the Directory of Open Access Journals (DOAJ), and Embase. We utilized a variety of keywords, such as acute kidney injury, glyoxylic acid, kidney biopsy, acute oxalate nephropathy, glycolic acid, hair-straightening products, formaldehyde, and kidney injury.

Hair-straightening product-associated AKI

The preponderance of keratin-based hair-straightening compounds in some countries comprises glycolic acid derivatives, which are believed safe when conducted topically. However, there is a case series that suggests a glycolic acid-based hair-straightening product is associated with the development of AKI. Additionally, glyoxylic acid, which is sometimes used in hair-straightening products, may release formaldehyde at high temperatures of heat processes during hair straightening. Formaldehyde is a known nephrotoxic agent and can cause AKI (6,7).

Systemic absorption of these products is probable; however, anecdotal reports have defined renal injury combined with their use. The case series reports a series of cases of serious renal failure after the use of hair-straightening agents over the past several years. The dominant finding on the kidney biopsy was acute oxalate nephropathy. Oxalate is an end product of glyoxylic acid. The elevated value of oxalate promotes calcium oxalate precipitation in different tissues, including the kidneys, directing renal toxic damage (1-3). The spectrum of renal damage after hair straightening ranges from mild to serious renal failure requiring kidney replacement therapy. The results of these studies highlight the sensitivity of the renal tissue to several environmental and commercial agents

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Implication for health policy/practice/research/ medical education

The hair-straightening products containing glycolic acid derivatives and formaldehyde are considered safe when used topically, but systemic absorption of these compounds is probable since anecdotal reports have explained renal injury accompanying their use

and the importance of considering hair-straightening products as a potential cause of AKI (6,8,9).

Therefore, the risks of using glycolic acid hair-straightening products include the potential for AKI and exposure to formaldehyde. However, these risks are rare, and most people who use hair-straightening products do not experience AKI or formaldehyde exposure (1,6).

Conclusion

Hair-straightening products containing glycolic acid derivatives and formaldehyde have been associated with AKI. There is a growing need to raise public awareness about the health risks associated with hair-straightening products. Education campaigns can play a crucial role in informing the public about the risks of using these products, encouraging safer alternatives, promoting product safety, and advocating for stricter regulations.

To reduce the risk of AKI and other health problems associated with hair-straightening products, it is important to choose products that do not contain formaldehyde or other harmful chemicals.

Authors' contribution

Conceptualization: Hamid Nasri.
Data curation: Soha Razmjouei, Hamid Nasri.
Resources: Hamid Nasri.
Validation: Hamid Nasri.
Writing–original draft: Soha Razmjouei, Hamid Nasri.
Writing–review and editing: Soha Razmjouei, Hamid Nasri.

Conflicts of interest

The authors declare that they have no competing interests.

Ethical issues

Ethical issues (including plagiarism, data fabrication, and double publication) have been completely observed by the authors.

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