Evidence summary: low- and middle-income countries

WHAM evidence summary: coffee powder for wound healing

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CLINICAL QUESTION

What is the best available evidence for topical coffee powder for improving wound healing?

SUMMARY

Coffee powder is used as a traditional wound healing option in low and middle resource communities, particularly in Indonesia[1, 2]. It is claimed to have antimicrobial, anti-inflammatory and antioxidant effects that promote growth of new tissue[1-4]. Additional possible benefits include absorption of wound exudate and concealing wound malodor. However, the evidence for the use of coffee powder for healing human wounds is very limited. Level 2[4] and Level 3[2] evidence reported complete wound healing within 12 weeks for diabetic foot ulcers (DFUs) treated with coffee powder without adverse effects. This was supported by Level 4 evidence[1, 3, 5]. However, all the studies were at high risk of bias, and there is a need for further research on the effectiveness and implications for using coffee powder before a recommendation could be made on this intervention for treating wounds.

CLINICAL PRACTICE RECOMMENDATIONS

All recommendations should be applied with consideration to the wound, the person, the health professional and the clinical context.

> There is insufficient evidence to make a recommendation on the use of topical coffee powder to promote wound healing.

SOURCES OF EVIDENCE: SEARCH AND APPRAISAL

This summary was conducted using methods published by the Joanna Briggs Institute[6-8]. The summary is based on a systematic literature search combining search terms related to topical coffee treatments and wound healing. Searches were conducted for evidence reporting use of topical coffee in human wounds published up to 30 June 2023 in English in the following databases: Cumulative Index to Nursing and Allied Health Literature (CINAHL), Medline (Ovid), Google Scholar, Embase (Ovid), AMED, Global Health, Health Internetwork Access to Research Initiative (Hinari, access via Research4Life) and Cochrane Library. Levels of evidence for intervention studies are reported in Table 1.

BACKGROUND

Coffee powder is described as a traditional option for treating wounds, particularly in Indonesia. Coffee powder is reported to have antioxidant, antimicrobial and anti-inflammatory effects[3, 4]. Bench research suggests that these properties might derive from coffee's chemical composition, including 5-hydroxymethylfurfural (5-HMF)[9], polyphenols (e.g., caffeic acid and chlorogenic acid)[10, 11] and growth factors[12]. Some bench research has reported accelerated wound healing in animal wounds treated with coffee powder[13-16]. Additional bench research has explored impregnation of coffee into wound dressing materials, but the literature search did not identify any clinical trials of these products[10, 11] in humans.

When coffee powder is placed in a wound bed it mixes with wound exudate resulting in a hyperosmolar solution with a low minimum inhibitory concentration against Methicillin-resistant *Staphylococcus aureus*[1-3, 5], *Streptococcus* spp. and gram-negative bacteria[5]. Coffee powder may absorb wound exudate[4, 5] and its aromatic characteristics might conceal wound malodor[1-4]. Another possible benefit of coffee powder described in the literature is protection of the wound bed[1-3]. When applied directly to the wound, coffee powder adheres to the wound bed surface. When changing the coffee powder dressing, the wound is not cleansed and the coffee layer in contact with the wound bed is left untouched. This allows epithelial tissue to develop without disruption[1, 3].

CLINICAL EVIDENCE ON COFFEE POWDER FOR WOUND HEALING

Studies reporting clinical outcomes for treatment with coffee are summarised in Table 2.

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Coffee powder for promoting wound healing

The strongest evidence for coffee powder comes from a quasi-experiment at high risk of bias that was conducted in people with DFUs[4]. The intervention group (n = 16) were treated with saline wound cleansing and application of Robusta coffee powder into the wound bed every second day. The control group (n = 16) received daily saline cleansing and were packed with saline- or povidone iodine-soaked gauze. Almost all (n = 30/32) participants also received systemic antibiotics. Wounds were assessed using the Bates-Jensen Wound Assessment Tool (BWAT) administered prior to commencing treatment and after two weeks. Both groups achieved statistically significant improvements ($p < 0.001$) in BWAT scores over two weeks of treatment, but the improvement was statistically significantly ($p = 0.005$) greater in the coffee powder group. Many of the participants were recruited to the study after their DFU had been surgically debrided (44% in the treatment group and 25% in the control group), which might have influenced the findings[4] (*Level 2*).

A comparative study[2] at high risk of bias reported coffee powder held in situ with gauze (n = 82) compared with saline-soaked gauze dressing (n = 78) in DFUs with a baseline wound diameter of 3—5 cm. The wound dressing was changed every four weeks for the coffee powder group and daily for the saline group. At 12 weeks, 100% of the wounds treated with coffee powder were completely healed versus 72% in the saline group ($p < 0.001$)[2] (*Level 3*).

The remaining evidence comes from case reports from Indonesia and Ethiopia. Two case reports[3] at high risk of bias reported use of coffee powder for healing deep DFUs of the heel. For the first DFU, dry coffee powder was applied directly to the wound bed, secured in place with gauze and tape and changed every 1—2 weeks. The ulcer healed completely within six months. The second case was described as a "festering" DFU that was treated with coffee powder applied directly into the wound bed and changed every 7—14 days. Complete healing was achieved within four months. For both cases, the report indicated that using coffee powder was protective of the epithelializing wound bed and also facilitated the person's mobility and independence[3] (*Level 4*).

Another case report at high risk of bias[1] described the treatment of DFUs with coffee powder. Following debridement of an abscess, the person had three DFUs on one foot. These were packed with 100 g of coffee powder and secured with a gauze bandage. As with the cases reported above, when changing the dressing the wound was not cleansed, the coffee powder directly in contact with the wound bed was left undisturbed and any loose, superficial coffee powder was replaced. The wounds healed completely within three months[1] (*Level 4*).

The next case report[5], also at high risk of bias, described the use of freshly roasted Robusta coffee to treat a paediatric patient with a thigh burn. Coffee powder applied directly to the child's burn was initiated on day four by the child's parent. The dressing was changed twice daily and maintained dry. After three weeks of home treatment with the coffee powder, the burn was completely healed[5] (*Level 4*).

CONSIDERATIONS FOR USE

- Consider local policies, procedures, and licensing before implementing traditional wound treatments.
- Robusta coffee is reported to have greater antioxidant properties than Arabica coffee and is reported to be the preferred coffee species for traditional wound treatment[4].
- In the research above, the coffee powder was ground from Robusta or Arabica beans (i.e., not instant coffee powder), purchased locally from coffee shops[3]. The process for grinding and the fineness of the powder were not reported, nor was any sterilization.

In the case studies above, coffee powder was used in a volume of approximately 80—100 g (enough to fill the wound bed). The coffee powder was secured in place with dry gauze and tape. When changing the coffee powder dressing, cleansing was avoided, any loose coffee was removed, leaving the layer of coffee in contact with the wound bed undisturbed. Fresh coffee powder was added[3]. In contrast, the treatment regimen in the quasi-experiment included saline cleansing when changing the coffee powder dressing, which necessitated more frequent dressing changes[4].

Adverse effects

No adverse events were reported in any of the research included in this evidence summary and no potential adverse effects were discussed in the literature.

Table 1: Levels of evidence for clinical studies

Level 1 evidence	Level 2 evidence	Level 3 evidence	Level 4 evidence	Level 5 evidence
Experimental designs	**Quasi-experimental designs**	**Observational – analytic designs**	**Observational – descriptive studies**	**Expert opinion/ bench research**
None	2.c Quasi-experimental prospectively controlled study[4]	3.c Cohort study with control group[2]	4.d Case study[1, 3, 5]	5.c Bench research[9-16]

Table 2: Summary of the evidence for coffee powder for wound healing

Study	Country	Coffee treatment and comparators (number wounds)	Type of wounds	Duration	Clinical outcome measures	Level of evidence
Garna et. al. (2019)[3]	Indonesia	80-100g of Robusta coffee powder applied directly into wound bed and changed 1-2 weekly (n = 2)	DFU	4-6 months	• Complete healing • Scarring	4
Hailemeskel and Fullas (2016)[5]	Ethiopia	Freshly powdered roasted coffee beans applied twice daily (n = 1)	Burn (degree unknown)	3 weeks	• Complete healing	4
Yulianti et. al. (2018)[4]	Indonesia	• Saline cleanse, Robusta coffee powder applied directly to wound bed, changed 2nd daily (n = 16) • Saline cleanse, saline or povidone iodine soaked gauze dressing changed daily (n = 16)	DFU	2 weeks	• Wound healing measured using BWAT	2
Yuwono (2014)[2]	Indonesia	• Robusta or Arabica coffee powder applied directly to wound bed, changed monthly (n = 82) • Saline gauze-soaked dressing, changed daily (n = 78)	DFU	12 weeks	• Complete healing	3
Yuwono (2019)[1]	Indonesia	100 g coffee powder applied directly into wound bed and changed weekly (n = 1 with n = 3 wounds)	DFU	3 months	• Complete healing • Scarring	4

CONFLICTS OF INTEREST

The author declares no conflicts of interest in accordance with International Committee of Medical Journal Editors (ICMJE) standards.

ABOUT WHAM EVIDENCE SUMMARIES

WHAM evidence summaries are consistent with methodology published in Munn Z, Lockwood C, Moola S. The development and use of evidence summaries for point of care information systems: A streamlined rapid review approach, Worldviews Evid Based Nurs. 2015;12(3):131-8. Methods are outlined in resources published by the Joanna Briggs Institute6-8 and on the WHAM Collaborative website: http://WHAMwounds.com. The WHAM evidence summaries undergo peer-review by a 20-member international, multidisciplinary Expert Reference Group (available on the website). WHAM evidence summaries provide a summary of the best available evidence on specific topics and make suggestions that can be used to inform clinical practice. Evidence contained within this summary should be evaluated by appropriately trained professionals with expertise in wound prevention and management, and the evidence should be considered in the context of the individual, the professional, the clinical setting and other relevant clinical information.

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