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Occupational Hand Dermatitis amongst Cassava Processors in Rural Communities in Southwest Nigeria

Dermatite Manuelle Professionnelle chez les Transformateurs de Manioc dans les Communautés Rurales du Sud-Ouest du Nigeria

¹*O. O. Ayanlowo, ²T. J. Okwor, ¹E. Otrfanowei

ABSTRACT

BACKGROUND: Hand dermatitis (HD) is an inflammatory disorder of the hand. Agricultural industries (farming) have been reported as one of the leading occupation predisposing workers to health risks. Practices such as dumping cassava peels in farm environment, removal of heaps of peels, soaking of cassava and clearing of ditches have been identified as potentially harmful. These processes, which are wet works, are often done with bare hands predisposing cassava processors to HD.

AIMS: This study aimed to determine the prevalence, predisposing factors and characteristics of HD amongst cassava processors in some rural communities in Southwest Nigeria.

METHODOLOGY: This was a cross-sectional prospective study involving females engaged in farming and processing of raw cassava into 'garri' meal using the traditional methods. Four hundred and twenty-six female cassava processors were included. The questionnaire used was an adaptation of the Nordic Occupational Skin Questionnaire (NOSQ-2002) which is used to document work related skin diseases of the hand and forearm, and exposures to environmental factor.

RESULTS: The mean age was 38.7 years and age range 13 – 70 years. Fifty-seven (13.4%) participants presented with HD within 12 months. Itching was the most common symptoms reported by 44 (10.3%) participants followed by pain 26 (6.1%) and small bumps 23 (4.9%) . The palmar surface of the right hand was most affected. None of the participants who use gloves regularly reported any symptoms of HD.

CONCLUSION: Cassava processors have been shown to be at potential risk of occupational HD; hence, health education and use of protective materials are important measures for prevention. **WAJM 2022; 39(10): 1089–1094.**

Keywords: Hand dermatitis, Cassava (garri), Farming, Occupation, Cassava processors, Cassava peels, Bare hands, Nordic Occupational Skin Questionnaire (NOSQ-2002).

RÉSUMÉ

CONTEXTE: La dermatite des mains (DH) est un trouble inflammatoire de la main. Les industries agricoles (agriculture) ont été signalées comme l'une des principales professions prédisposant les travailleurs à des risques pour la santé. Des pratiques telles que le déversement des épluchures de manioc dans l'environnement agricole, l'enlèvement des tas d'épluchures, le trempage du manioc et le curage des fossés ont été identifiées comme potentiellement dangereuses. Ces processus, qui sont des travaux humides, sont souvent effectués à mains nues, ce qui prédispose les transformateurs de manioc aux HD.

OBJECTIFS: Cette étude visait à déterminer la prévalence, les facteurs de prédisposition et les caractéristiques de la DH chez les transformateurs de manioc dans certaines communautés rurales du sud-ouest du Nigeria.

MÉTHODOLOGIE: Il s'agissait d'une étude transversale prospective impliquant des femmes engagées dans l'agriculture et la transformation du manioc brut en farine 'garri' en utilisant les méthodes traditionnelles. Le questionnaire utilisé était une adaptation du Nordic Occupational Skin Questionnaire (NOSQ-2002).

RÉSULTATS: Quatre cent vingt-six femmes transformatrices de manioc ont été incluses. L'âge moyen était de 38,7 ans et la fourchette d'âge de 13 à 70 ans. Cinquante-sept (13,4 %) participantes ont présenté une DH dans les 12 mois. Les démangeaisons étaient les symptômes les plus courants rapportés par 44 participants, suivis par la douleur (26) et les petites bosses (23). La surface palmaire de la main droite était la plus touchée. Aucun des participants qui utilisent régulièrement des gants n'a signalé de symptômes de MH.

CONCLUSION: Il a été démontré que les transformateurs de manioc sont exposés à un risque potentiel de MH professionnelle ; par conséquent, l'éducation sanitaire et l'utilisation de matériaux de protection sont des mesures importantes pour la prévention. **WAJM 2022; 39(10): 1089–1094.**

Mots clés: Dermatite des mains, Manioc (garri), Agriculture, Profession, Transformateurs de manioc, Épluchures de manioc, Mains nues, Nordic Occupational Skin Questionnaire (NOSQ-2002).

¹Dermatology Unit, Department of Medicine, Faculty of Clinical Sciences, College of Medicine, University of Lagos, Lagos State, Nigeria. ²Nigerian Centre for Disease Control, 801, Ebitu Ukiwe Street, Jabi, Abuja, Nigeria.

*Correspondence: Dr. Olusola Ayanlowo, Department of Medicine, Faculty of Clinical Sciences, College of Medicine, University of Lagos, Lagos State, Nigeria. Email: solayan05@yahoo.com Phone: +2348034721690.

INTRODUCTION

Hand dermatitis, also referred to as hand eczema, is an inflammatory disorder of the hand which presents acutely with swelling, erythema, scaling, oozing and impetiginization, and chronically with hyperkeratosis, fissuring and dyspigmentation.¹ The causes of hand dermatitis are many and include occupation, irritant, allergic contact dermatitis, atopy and fungal infections.² Occupations known to predispose to hand dermatitis are jobs that involve wet works, agriculture, contact with chemicals such as hair dressing, cooks, hospital work, construction, manufacturing, laundering, food handling, gardening, automobile repairs and domestic work.¹

Occupational dermatoses are a group of skin disorders in which the work a person does serves as a major causative or predisposing factor.^{2,3} The United States (US) Bureau of Labour Statistics, National Institute of Occupational Safety and Health reported that occupational skin disorders are the second most common type of work related problems, second to trauma, accounting for 12% of occupational health disorders.⁴ Factors indicating that a dermatosis is occupationally related include contact with substances or agents that cause similar changes in other individuals at work, or in similar occupation, and lesions appearing after exposure to the work and improve or clear on removal of exposure. Correct timing between exposure and dermatitis, and type and site of lesion consistent with information on exposure can indicate occupational exposure.² The hand is the most common site affected in occupational skin disorders and affects the quality of life of affected individuals significantly.^{1,5}

The agricultural industry has been reported as one of the leading occupations that predispose workers to health risks.^{2,4} Some of the health hazards reported amongst farmers are associated with use of farm machinery, biological hazards, psychosocial stress and use of farm chemicals.⁶ Contact dermatitis has been reported as the most common skin disease, while dermatophytosis was the most reported infection amongst farmers.^{3,6}

Farming is the predominant occupation amongst the rural dwellers in South-West Nigeria.⁷ This farming is largely subsistent and non-mechanized employing the use of the traditional hoe and cutlass which exposes the hands to various hazards such as contact dermatitis and trauma.^{6,8} Researchers identified practices such as dumping cassava peels in farm environment, removal of heaps of cassava tuber peelings, soaking of cassava and clearing of ditches amongst farmers as potentially harmful and predispose the workers to hand dermatitis.⁹ Occupational hand dermatitis has been documented amongst hairdressers, mechanics and artisans in Nigeria,^{10,11} however; it is yet to be documented in farmers and farm workers in Nigeria.

Nigeria is the largest producer of cassava in the world and 'garri' is the fermented, flaky product of cassava.¹² The processing of cassava into the popular '*Ijebu-garri*' is the major post-harvest activity in communities in Ogun State, Southwest of Nigeria.⁷ Over 90% of the garri processors are females.¹³ The processing of cassava into garri involves a number of stages which includes peeling and grating of the cassava; putting the grated cassava into jute bags⁸ to ferment under weights which squeeze out water; removal of fermented cassava from the bags and crushing them into powdery form; and frying. The garri is fried over local stoves made from mud in a 'U' shaped pit using rectangular shaped shallow pans known as "Agbada" stirring continually with a short, handled paddle. The garri processing plants are mainly individually-owned small scale businesses and the garri processors rent the local mud stoves "Amo" daily for the frying.⁸ The farming and processing of cassava is done with bare hands and exposes the skin to soil, cassava plants, cassava peels and water (during washing and soaking) which are potential irritants and allergens.

The aim of this study is to determine the prevalence, predisposing factors and characteristics of hand dermatitis amongst cassava processors in rural communities in Southwest.

SUBJECTS, MATERIALS AND METHODS

The study was conducted in

Odogbolu Local Government Area (LGA) of Ogun State, Southwest Nigeria. Odogbolu LGA is in Ogun East Senatorial District and the headquarter is Odogbolu town. The LGA has an area of 545, 223 km² and a population of 125,657 (63, 838 males and 61,819 females) at the 2006 census.¹² Odogbolu Local Government Area shares borders on its Northern fringes with Ijebu North Local Government, on the East with Ijebu Ode and Ikenne LGAs. It shares its southern border with Epe LGA of Lagos state. The inhabitants of Odogbolu are mainly Yorubas of the Ijebu extraction.^{13,14} Agriculture is the main occupation of the people of Ogun State, providing income and employment through growing food crops such as maize, cassava, yam, cocoyam, soybean amongst others.^{15,16}

The study was a cross-sectional study of 415 consenting female cassava farmers and processors aged 13–70 years conducted in Odogbolu L.G.A in July 2014 over a four-week period. The women who gave their consent were included in the study. People who processed cassava into *elubo* powder and *fufu*, which are other types of cassava meals and those who did not give their consent were excluded. Sample size determination: $n = n = Z^2pq/D^2$ (34.3% prevalence was used)¹⁷ = 346; 20% attrition rate giving minimum of 415. The questionnaire used was an adaptation of the Nordic Occupational Skin Questionnaire (NOSQ–2002) which has been validated.¹⁸ The questionnaire was interviewer administered. Participants rated the severity of hand dermatitis on a Visual Analogue Scale (VAS) of 0 to 10 with 0 to 3 as mild, 4 to 7 as moderate and 8 to 10 as severe. All individuals with lesions in the hand were examined by the authors and morphology documented.

Four wards out of the fifteen wards in Odogbolu LGA were selected by a simple random sampling (balloting). The selected wards were Odogbolu, Ijesha, Okunowa, and Araromi. A rapid census survey was conducted to identify and enumerate all the garri processing plants in the four wards. Then all the workers in the plants were approached for recruitment into the study. Those workers who could neither comprehend Yoruba nor English were not recruited.

Six research assistants, three females and three males, who had a minimum of Ordinary National Diploma (OND) and fluent in Yoruba, were trained to assist in organising the participants and collecting the demographics. The key resource persons in the training were the researchers (Dermatologists with primary interest in contact dermatitis and a Public Health Physician with MSc thesis in Hand dermatitis in hairdressers). A pilot study was carried out amongst workers in Imodi, one of the wards in the local government area. This ward was excluded from the final study.

Data was checked during the data collection process and afterwards for completeness and obvious errors. The data was entered on Excel spreadsheet. Analysis was done using the IBM SPSS Statistics 20. Absolute and relative frequencies were calculated for qualitative variables and means (SD) for quantitative variables. Associations between study variables were evaluated by analytical statistical methods, using the Pearson Chi square test for categorical variables. Statistical significance was set at $p < 0.05$.

Ethical approval was sought for and obtained from the Research Ethics Committee of Lagos University Teaching Hospital, Idi-Araba. (HREC assigned number: ADM/DCST/HREC/980). Respondents were addressed before the administration of questionnaires and necessary clarifications were appropriately done. The written informed consent was obtained from each respondent after the content was clearly and fully explained and understood. Parents of participants less than 18 years gave the permission and consent for them, while they gave the assent for the study.

RESULTS

Four hundred and twenty-six females were included in the study. The socio-demographic characteristics of the participants are shown in Table 1. The youngest was 13 years while the oldest was 70 years old. The mean age was 38.7 ± 12.5 years. Fifty-seven (13.4%) participants presented with hand dermatitis on examination, all of which occurred within 12 months of recruitment.

Table 1: Socio-demographic Characteristics of Study Participants

Characteristics of Participants n=426	Frequency (%)
Age Distribution	
<18	22 (5.2)
18–29	86 (20.2)
30–39	99 (23.2)
40–49	121 (28.4)
>49	98 (23.0)
Age Range	13 to 70
Mean Age + Standard Deviation	38.7 + 12.5
Level of Education	
No formal	210 (49.3)
Primary	113 (26.5)
Secondary	97 (22.8)
Post-secondary	6 (1.4)

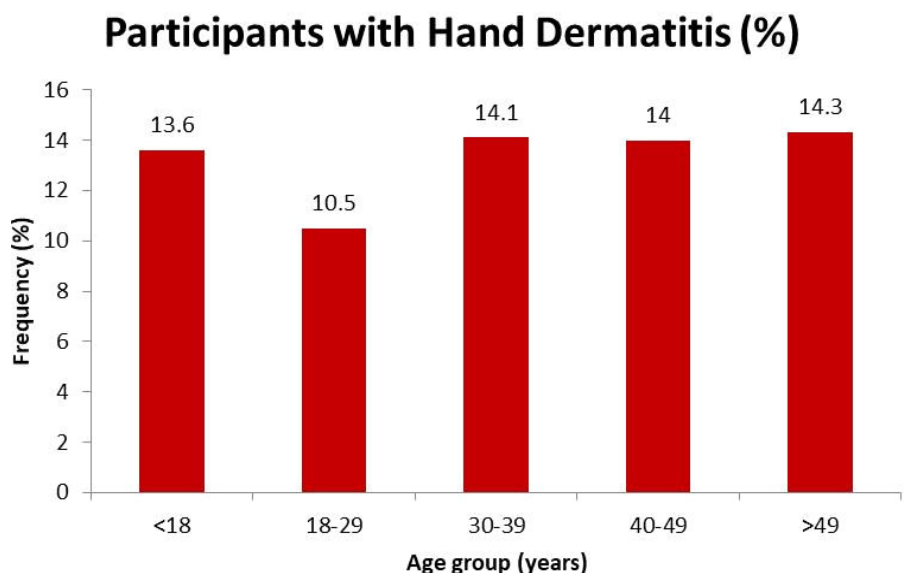


Fig. 1: Frequency of Hand Dermatitis by Age Group.

Table 2: Clinical Features of Hand Dermatitis Reported by Respondent n=57

Symptoms/Signs	Frequency (%)
Itching	44 (77.2)
Aching or Pain	26 (45.6)
Papules (small bumps)	23 (40.4)
Dry skin with scales and flaking	21 (36.8)
Redness	16 (28.1)
Skin tenderness	11 (19.3)
Tiny water blisters (vesicles)	10 (17.5)
Weeping, oozing or crusts	8 (14.0)
Rapidly appearing itchy hives, wheals or welts	8 (14.0)
Burning, prickling or stinging of the skin	8 (14.0)

Participants had more than one symptom/sign

Two hundred and sixteen participants (53%) were of Yoruba tribe. Many women from other Nigerian tribes living in this communities were also involved in cassava processing: 81 (20%) were Iggede (North Central); 56 (13.8%) were Delta (South South); 44 (10.9%) were from Southeast and others from Northeast and Northwest. Figure 1 shows the prevalence of hand dermatitis according to age group.

Forty-three (75.4%) of the participants with hand dermatitis had a history of atopic dermatitis; p value <0.001 . Twenty-four (42%) of the 57 participants with hand dermatitis reported a history of allergic eye symptoms. Sixty-two participants (14.6%) had previous history of hand dermatitis. There was a background history of atopic dermatitis (recurrent flexural dermatitis) in 66 (15%) and allergic eye symptoms in 135 (31%) of all study participants. Twenty-eight of the participants (20.7%) with atopic dermatitis had associated allergic eye symptoms.

Twenty-one (36.8%) of the 57 participants with hand dermatitis gave a history of frequent exposure to wet work: one participant gave exposure less than half an hour, 3 gave exposure of half an hour to two hours while 17 had greater than two hours of exposure to wet works.

Twenty participants (35.1%) gave a history of exposure to materials outside cassava processing. These include tablet soaps, liquid soaps, shampoo, and personal hygiene products in 6 (30%); detergents, household cleaning and laundry products 4 (20%); work with wet hands in 4 (20%); frequent hand washing in 3 (15%); handling of food in 2 (10%); and tomato water in 1 (5%). Nine (15.8%) participants reported improvement of hand dermatitis while they were away from work while 3 (5.3%) reported improvement of wrist dermatitis while/when away from work. Six participants with HD reported use of gloves regularly for cassava processing and 2 reported irregular use of gloves. None of the participants who use gloves regularly reported any symptoms of HD.

Table 2 shows symptoms of hand dermatitis reported by participants. Itching was the most common symptoms reported by 44 participants (77.2%)

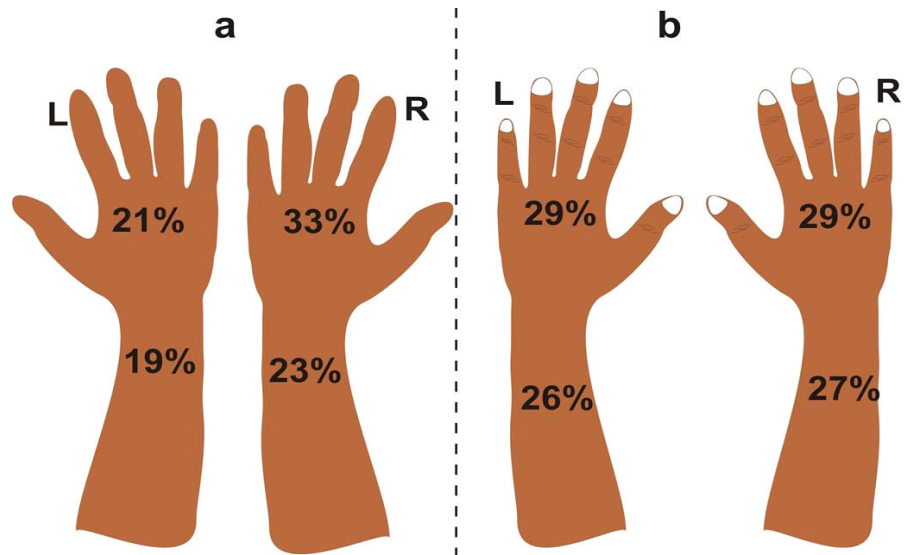


Fig. 2: Frequency of affected Sites: a Palmar Surface b- Dorsal Surface

followed by pain in 26 (45.6%) and small bumps (papules) in 23 (40.4%) respondents. Thirty-one of the participants with hand dermatitis responded to the visual analogue (VAS) rating of the severity of the hand dermatitis. Eight participants (25.8%) had mild disease, 19 (61.3%) had moderate disease and 4 (12.9%) had severe disease. Figure 2 shows the parts of the hand affected with the right palmar surface being most affected.

DISCUSSION

Occupational hand disease (OHD) ranked first amongst occupational diseases with an estimated incidence above 0.7 workers per 1,000 per year in a European based study.¹⁹ In Nigeria, there is a dearth of data on OHD and the Employee compensation act of 2010 is not strictly adhered to in most industries.²⁰ The agricultural industry is still largely primitive with majority of the farmers practising non-mechanized farming hence the high frequency of hand dermatitis (HD) is expected.

Fifty-seven (13.4%) of participants had hand dermatitis, though 62 (14.6%) participants had a history of hand dermatitis in their lifetime. Lower prevalence of OHD within one year in this study compared to lifetime prevalence may be related to the phenomenon of hardening in irritant contact dermatitis. When the skin is repeatedly exposed to

the same irritant, it develops some semblance of resistance and no longer manifests the acute symptoms of dermatitis, but progresses to the chronicity.²¹⁻²⁴ A study comparing dermatoses amongst rice farmers in two communes of a peri-urban district in Vietnam, 56% of 159 participants had occupational hand dermatitis within a similar period of review.²⁵ In a study by Bauer, *et al* in Germany, there was a 76 % prevalence rate of occupational hand dermatitis in workers within the catering industry.²⁶ In a recent study on HD in Lagos, Nigeria, a significant 67.2% of 177 patients had chronic HD.²⁴

Hand dermatitis was found predominantly in respondents in the 4th decade of life though not in statistically significant proportions. This is likely because these women have been farming and processing cassava in an unprotected manner for many years and are still the active work force. Reports of HD in Ethiopia and Nigeria however documented higher frequency in the 3rd decade of life.^{23,24,27} The lowest prevalence was in respondents less than 18 years, and this may be because this age group is hopefully still in school, hence not available for farm work. It may however also be an indication that the younger (new) generation is uninterested in farming (in its current non-mechanized form) as a means of livelihood. Ignorance

may be a possible perpetuating factor of the disease in the respondents as most of them had little or no formal education. Simple measures like community education with videos, playlets, patient information leaflets, with pictorial representations of cause, triggers, flares, and effect of OHD, may reduce the impact of the disease on the farm workers.

A review of the clinical features shows that the respondents suffer from both acute and chronic HD. Itching and pain were the most recurring symptoms. Features of chronicity (dry, scaly, lichenification) were more frequently documented than features of acute dermatitis (erythema, weeping and oozing blisters with crusts) as documented in both local and foreign studies.^{23,24,28} Respondents with rapidly appearing itchy wheals and associated burning, prickly sensations may be indicative of urticaria rather than HD. The symptoms and signs of hand dermatitis are similar irrespective of the race of the sufferer or the possible triggers.²⁵

The right palmar surface was found to be most affected closely followed by the dorsal surfaces of both hands and forearms. The right hand is dominant in most people thus more exposed to wet works and other farming processes. The dorsum of the hands and fingertips are usually the more commonly affected areas in HD because of increased contact with irritants or allergens as well as a nidus of infections.^{24,29,30} The involvement of the forearm suggests prolonged exposure to cassava water because of the routine dipping of the upper arms up to the elbow into the jute sacks of fermenting cassava. Forearm dermatitis is not typically written about, but it is not surprising that the respondents in this series have this presentation. Cassava processing and fermentation releases hydrogen cyanide (prussic acid) which has many non-beneficial health effects of which dermal irritation is significant and dermal absorption can cause systemic toxicity.³¹ Prolonged and recurrent exposure to the cassava water provokes and perpetuates the hand dermatitis.

The other triggers or possible cause of symptoms as identified by patients include wet work, soaps and detergents and personal hygiene products are

similar to those implicated in Irritant Contact Dermatitis (ICD) in studies worldwide.^{27,28} Considering that they are daily exposed to their personal hygiene products, soaps and detergents whether they are at work or not, it stands to reason that the extra exposure to cassava water is a logical cause for their hand dermatitis.

The relationship of the OHD to the cassava processing work is exemplified in the 15.8% of participants who said their symptoms improved when they were away from work. As seen in other studies of OCD, symptoms tend to resolve or reduce whilst away from work.^{26,27} Participants who wore gloves whilst at work also had no symptoms of HD. There was a statistically significant personal or family history of atopy in respondents with HD. Irritant contact dermatitis is generally reported to be the more prevalent cause of hand dermatitis and a state of atopy predisposes patients to irritant rather than allergic contact dermatitis, so this finding is in keeping with other studies.^{24,27,28} The heat which emanates during frying of the garri may serve as a perpetuating factor to worsen symptoms. Skin disorders that may result from frying the dried fermented cassava into *garri* may also be prevented with the use of protective work wear.

Limitation to the Study

A major limitation to the study is that the Nordic Occupational Skin Questionnaire (NOSQ-2002) is self-reported, with many aspects relying on the participants' memory. The instrument was not designed in this environment and required an interpreter for translation into everyday Nigerian-spoken English. A pilot study was therefore carried out to investigate the feasibility of its use in this environment. Despite these limitations, the questionnaire was able to gather information on presence of hand dermatitis in the respondents. Another limitation was the inability to carry out a patch test which would have helped in ruling out an allergic contact dermatitis and determining specific culprit allergen if present. The strength of this study lies in the fact that it is a community-based study, it employed probability sampling technique to reduce bias as well as it added to the body of knowledge on the prevalence of hand dermatitis amongst

cassava farmers and hand processors from the food processes.

CONCLUSION

This study has demonstrated that hand dermatitis is prevalent among cassava farmers in rural South-Western areas in Nigeria who practice non-mechanized farming. It also shows that most workers do not use protective measures such as gloves, hence prolonged exposure of bare hands and forearms to cassava water and chronicity of the disease. There is a need for the relevant authorities to recognize the economic contribution this group of workers add to the country and improve on their farming methods as well as provide protective work equipment. Community education and information may reduce the impact of the disease on the farm workers.

What is known about this topic?

- The hand is the most common site affected by occupational skin disorders
- Agricultural processes predispose farmers, food processors and allied workers to hand dermatitis.

What this study adds:

- Cassava (garri) processing methods such as peeling and washing predispose the workers to occupational hand dermatitis
- Some cassava processors with hand dermatitis had a background history of atopy
- Majority of the cassava processors do their work manually without the use of protective materials such as gloves.
- Prolonged exposure of bare hands and forearms to cassava leads to chronicity of lesions

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No conflicts of interest declared by authors.

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