

ORIGINAL CONTRIBUTIONS

OCCUPATIONAL DERMATOSES AMONG THE CASHEW NUT WORKERS IN KARNATAKA

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Seventy five female workers employed in the cashew nut industry in Karnataka to slice off the outer hard shells from the nuts and thus exposed to the cashew nut shell oil had a characteristic cauterization type of reaction manifesting as brownish-black, thickened sheats of dead skin covering the dorsal as well as the palmar aspects of hands including the fingers, and feet. Smaller but similar lesions were also seen on those parts of the forearms, abdomen, neck and face which were not covered with clothes. The fingers were thinned and tapering and several nail's of the hands and feet were thickened, discolored and eaten away. The other changes included loss of the dermatoglyphic patterns, maceration of the hands, small pits on the finger tips and pitted keratolysis seen in some cases only. Similar changes were also seen on the feet of both the male workers exposed to the same oil, in the section which extracts the oil from the sliced shells. In contrast, 29 female workers engaged to peel off the thin reddish covering on the cashew nut, had normal hands and feet, except for the two callosities on the flexural aspect of the proximal phalanx of the right middle finger, and proximal interphalangeal joint of the right index finger respectively, caused by the friction of the peeling knife. An open patch test with the cashew nut shell oil used as such in 37 workers produced a cauterization type of reaction in 32 workers irrespective of the nature of their duties, while the standard occluded patch test with 10% cashew nut shell oil in polyethylene glycol showed a mild cauterization type of reaction in only 6 workers. Patch tests with 1% and 0.1% concentrations of the shell oil were negative in all the workers. Two barrier creams tested to protect the workers from the cashew nut shell oil, produced reasonably effective results within a week.

Key words : Survey, Cashew nut workers, Dermatoses.

A variety of occupational dermatoses can be encountered in different industries but the incidence in India has generally been low.¹ The few exceptions include, contact dermatitis due to the insulating tape used in a heavy electricals industry in Uttar Pradesh,² contact dermatitis due to the dyes in the tie-and-dye industry in

Rajasthan,³ and maceration and pitted keratolysis of the hands because of prolonged immersion in warm alkaline water among the silk workers in Karnataka.^{4,5} We have recently conducted a survey of the cashew nut workers in Karnataka, the results of which are being reported.

Materials and Methods

The cashew nut industry surveyed by us was located at Joduraste (Karkala) nearly 35 km from Manipal (Karnataka). It receives cashew nuts plucked from the cashew nut trees growing in the adjoining villages of Karnataka, Maharashtra and Kerala, and also from Africa and

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some south-east Asian countries. These cashew nuts are generally dried in the sun before sending to the factory and are still encased in their shells. In the factory, the cashew nuts are first roasted in steam at 90°C in large chambers for 20-25 minutes, and then cooled in the air overnight. This process makes the cashew kernels detach themselves from the shell. Next, the cashew nuts are sent to the cutting section where each cashew nut is pressed between two cutting blades which cut off the hard outer shell to liberate the cashew kernel encased in the reddish thin pericarp. This section employs females only. One of the girls places the cashew nuts one by one with her hands between the cutting blades and operates these blades with her feet to cut the shell, while the other sits on the floor on the other side, to pick up the cashew kernels from among the sliced shells. The hands and feet of both these girls are exposed to the oil present in the shell, but they routinely apply castor oil on their hands and feet as a protective. The liberated cashew kernels are next kept in a hot air chamber and then given to the female employees to scrape off the thin reddish pericarp with the help of a specially designed knife. The knife is held in the right hand, while the cashew nut is held between the thumb and the fingers of the left hand. The peeling is done either at the homes of these girls, or in the peeling section of the factory. The peeled cashew kernels are then classified into different quality grades depending upon whether these are intact whole kernels, or these are broken into different sized pieces. After grading, these cashew kernels are packed into tins and sealed for despatch. The shells of the cashew nuts are taken into another section where the shells are crushed between rollers and the liberated cashew nut shell oil is collected. The residue, the shell cakes are burnt as fuel, while the crude oil is heated at 450°C for 3-4 hours to take away the moisture from the cashew nut shell oil.

The cashew nut factory surveyed by us employs 400 female workers in the cutting, peeling and grading sections, and 50 male workers in the packing and sealing section, the shell oil extracting section, and the supervisory staff. We examined most of the workers from all the sections but recorded the findings in 75 workers from the cutting section, 29 workers from the peeling and grading section and both the workers from the cashew nut shell oil extraction unit.

Patch tests were applied on 37 workers (22 workers from the cutting section, 13 from the peeling and grading section and both the male workers in the cashew nut shell oil extraction section). The antigens used consisted of the crude cashew nut shell oil applied as such as an open patch,⁶ the heated shell oil in concentrations of 10%, 1.0% and 0.1% in polyethylene glycol, castor oil as such used by the girls in the cutting section, and the polyethylene glycol (PEG) base (as a control). Results of the open patch tests were recorded at 24 hours and again at 48 hours, while the other patch tests were examined only after 48 hours.

To test the efficacy of the two barrier creams developed by us to protect the workers from the effects of the cashew nut shell oil, 24 workers from the cutting section having dermatitis on their hands were divided into two groups of 12 workers each and given the two barrier creams code-named BP and PEG respectively. The workers were asked to massage their respective barrier creams on all parts of the hands before starting their work in the morning and again after the lunch break. The severity of the skin changes in each worker was graded by giving scores of 5, 3, 1 and 0 as per table I, for each of the 5 parameters viz cauterization of skin, maceration, fissuring of finger tips, loss of dermatoglyphic patterns and palmar pits. This grading was done before starting the trial

Table I. Grading the severity of skin changes.

The skin changes	Intensity of the skin changes graded as score		
	1	3	5
Brownish discoloration	Scattered lesions over fingers only	Scattered lesions over fingers and palm	Diffuse involvement of fingers and palm
Maceration	One finger	More than one finger	All fingers
Fissuring of finger tips	One finger	More than one finger	All fingers
Loss of dermatoglyphic patterns	Smoothing of one finger	More than one finger	All fingers
Palmar pits	1 to 10	10 to 100	More than 100

and again 7 days after using the barrier creams.

Results

The workers in the cutting section were all females between 16 and 60 years in age, and each of them showed a characteristic clinical pattern of cutaneous involvement (Figs. 1 and 2). The skin over the dorsal aspect of their fingers was covered with uniformly glazed, brownish black, thickened sheets of dead skin (cauterization reaction). Some areas from where

these sheets of dead skin had fallen off were thin and atrophic. Similar involvement was seen on the palms and the palmar aspects of the fingers but the creases of the palms were spared. The fingers were generally narrowed and tapering towards their distal ends, and the dermatoglyphic patterns on the finger tips were obliterated. The nail plates were also stained brown, especially the keratinous lining which fixes the paronychia skin



Figs. 1 and 2. Brownish black areas of cauterized skin, with tapering of fingers and dystrophic nails.

to the nail plate along its periphery. Some of the nails were thickened, irregular at their distal edges and eaten up in a manner similar to the fungal infection of the nail plate. The feet were also similarly involved but the involvement of the soles was more marked in the arch of the foot and all along the sides of the foot, rather than the weight-bearing areas of the soles.

Apart from these, 1-4 mm, superficial areas of brownish discoloration often irregular in shape (Fig. 3), were diffusely present on the forearms and legs especially on their extensor aspects, the left half of the middle of abdomen, the right side of the neck and upper chest, and rarely on the face. All these areas were unprotected by the clothes that these girls were wearing.

None of these workers complained of itching, burning or pain. In addition, 52 workers had maceration on their hands which increased in intensity with the duration of work on that day. They also had small 1-2 mm pits on their finger tips. Such pits were not seen on the palms or soles. Pitted keratolysis was seen on the soles of 11 workers.

Workers in the peeling and grading section were also all females in the age range of 13 to

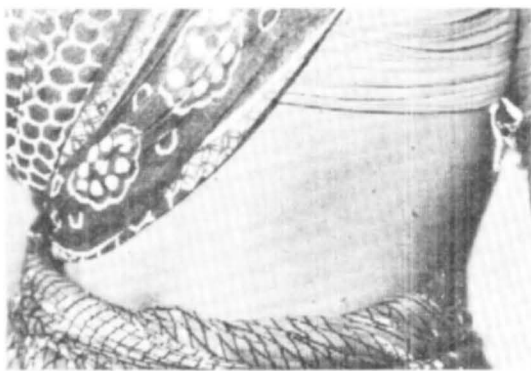


Fig. 3. Small areas of cauterized skin on the uncovered part of abdomen,

50 years (majority of them being between 15 and 20 years). Sixteen of these girls were working in the peeling section only, 8 were doing peeling as well as grading work, while 5 were doing grading only. All the girls engaged in the peeling work displayed a callosity on the palmar aspect of the proximal interphalangeal joint of the right index finger. The larger of these callosities were bisected by a longitudinal groove placed obliquely across the lesion, corresponding to the metallic edge of the knife. The second callosity was situated on the palmar aspect of the proximal phalanx of the right middle finger corresponding to the area where the end of the peeling knife would rub against the finger, but this callosity was generally smaller and seen in only 18 of the 24 workers. Flexural aspects of the tips of the thumb, index and middle fingers of the left hand of these workers showed asymptomatic criss-cross fissuring. Workers in the grading section showed only very mild, asymptomatic fissuring of the tips of the thumb, index and middle fingers of one or both hands. None of the workers in the peeling and grading section showed tapering of the fingers, loss of the dermatoglyphic patterns or the nail deformities. Their hands and feet otherwise were quite normal.

The two workers employed in the cashew nut shell oil extraction unit were males who showed a severe and uniform cauterization reaction manifesting as thickening and brownish discoloration of the soles of both the feet, sparing the arch of the feet. The toe nails were brownish, thickened and frayed at their distal edges. Both the palms showed lesions resembling pitted keratolysis, which was more marked at the periphery of the hands especially the thenar and the hypothenar eminences and the finger tips, and less on the palms. The skin over the palms and the pulp of the fingers was smooth and shiny and the dermatoglyphic patterns were deficient.

The open patch test with the crude cashew nut shell oil produced a cauterization type of reaction in 32 out of the 37 workers irrespective of the nature of their duties. In 7 of these workers the reaction was mild, while in 16 workers it produced a single large brownish bulla (Fig. 4) or multiple small vesicles. Only 5 workers (3 from the cutting section and 2 from the peeling and grading section) did not develop any reaction. The standard occluded patch test with 10% shell oil in PEG showed (\pm) reactions in only 6 patients (3 each from the cutting, and the peeling and grading sections), but none of these reactions was papulo-vesicular in nature to suggest hypersensitivity. Lower concentrations of the shell oil produced negative results in all the workers. Castor oil produced a mild reaction in 2 workers from the cutting section and a doubtful reaction in 1 male worker from the oil extraction section. PEG used as a control did not produce any reaction in any of the workers.

Relative efficacy of the two barrier creams is shown in table II. PEG cream seemed to be superior to BP cream for amelioration of the cauterization reaction, the total scores of all the workers in the two groups before and after the trial being 44 and 19 respectively for PEG, and 31 and 23 for BP. The effect on maceration was variable, a few workers even getting more

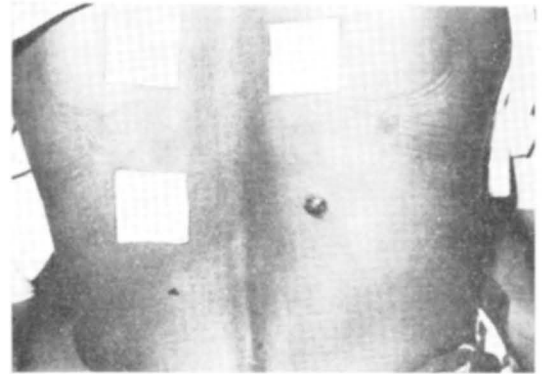


Fig. 4. The cauterization type of reaction to the open patch test with the cashew nut shell oil.

maceration compared to that before starting the trial.

Comments

Industrial dermatology is interesting because it is often possible to see a large number of individuals manifesting a particular set of symptoms/signs which one hardly comes across in the routine hospital practice. It was thus intriguing to see almost every girl in the cutting section having the cauterization type of reaction on the skin. The clinical picture was an exaggeration of the reaction which follows topical applications of cauterizing agents (cauterants) such as carbolic acid (phenol) or trichloroacetic acid for the treatment of molluscum contagiosum, warts, corns and other similar lesions. We prefer to call this reaction as cauterization reaction, distinct from the irritant dermatitis because there are definite differences between the two types of reactions.⁷ Cauterants tend to char the skin, and the mild reaction that follows, is intended for repair of the damage. This reaction never manifests with papulo-vesicular lesions. The irritant reaction on the other hand stimulates a dermatitic process in the skin and manifests with either a scaly dermatitis (subacute dermatitis due to repeated-insultant irritants) or a papulo-vesicular reaction

Table II. Comparison of the protective effects of the two barrier creams BP and PEG.

Clinical criterion	Number of workers having					
	Improvement		No change		Worsening	
	BP	PEG	BP	PEG	BP	PEG
1. Cauterization of skin	5	10	5	1	1	0
2. Maceration	3	3	4	6	4	2
3. Fissuring of finger tips	4	4	7	7	0	0
4. Loss of dermatoglyphic ridges	5	2	4	9	2	0
5. Pits on palms	7	3	4	8	0	0

(acute irritant dermatitis). Patch testing also reflects the same differences, cauterants producing a brownish discoloration (charring)⁸ or a single large brownish blister on the skin, while the irritants produce the characteristic papular or papulo-vesicular reaction as classically seen with dinitrochlorobenzene. Both types of reactions however occur in almost all the individuals exposed to the agent.

The intensity of the cauterization reaction in the cashew nut workers was proportional to the degree of exposure. It was maximum on the hands and feet, less on the forearms and abdomen and least on the face. The areas covered by the clothes were completely protected. It was also known that the skin would return to normal if the worker went on a holiday for a few weeks. The lesions on the hands and feet occurred due to direct contact with the materials containing the oil, while those on the forearms, abdomen and neck were due to the splashing droplets of the shell oil. There was no indication of contact dermatitis in any of these workers. Patch test results confirmed the cauterizing nature of the shell oil, which produced a cauterizing reaction in almost all the workers, and dilution of the agent to even 10% led to disappearance of the reaction in most of them. This is in contrast to the other patient reported separately⁹ who had displayed a true hypersensitivity to the cashew nut oil and gave a positive patch test even with 0.1% concentration of the cashew nut shell oil.

Some of the other changes such as thin tapering fingers, loss of dermatoglyphic patterns on finger tips and the pits were also due to the effect of repeated cauterizations of the skin, because these changes were not seen in the workers of the peeling and grading section even though they belonged to the same ethnic group. Similarly, the thick brown dystrophic nails were also observed only in the cutting section and the shell oil extraction unit and were thus attributable to the effect of the shell oil.

Callosities seen in the workers engaged in the peeling work were typically localised to the areas subject to friction, while the criss-cross fissuring of the finger tips has been earlier observed by us in response to the friction on the finger tips.¹ This was however, quite different from the picture produced by contact dermatitis due to the vegetables.¹⁰

The most important aspect of such studies has to be the attempts to relieve the suffering of the workers. The castor oil being used by these workers was obviously far from satisfactory. Of the two barrier creams tried by us, PEG seemed to work better and faster for alleviation of the cauterization type of reaction. A longer follow up however, is necessary to find the most suitable barrier.

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